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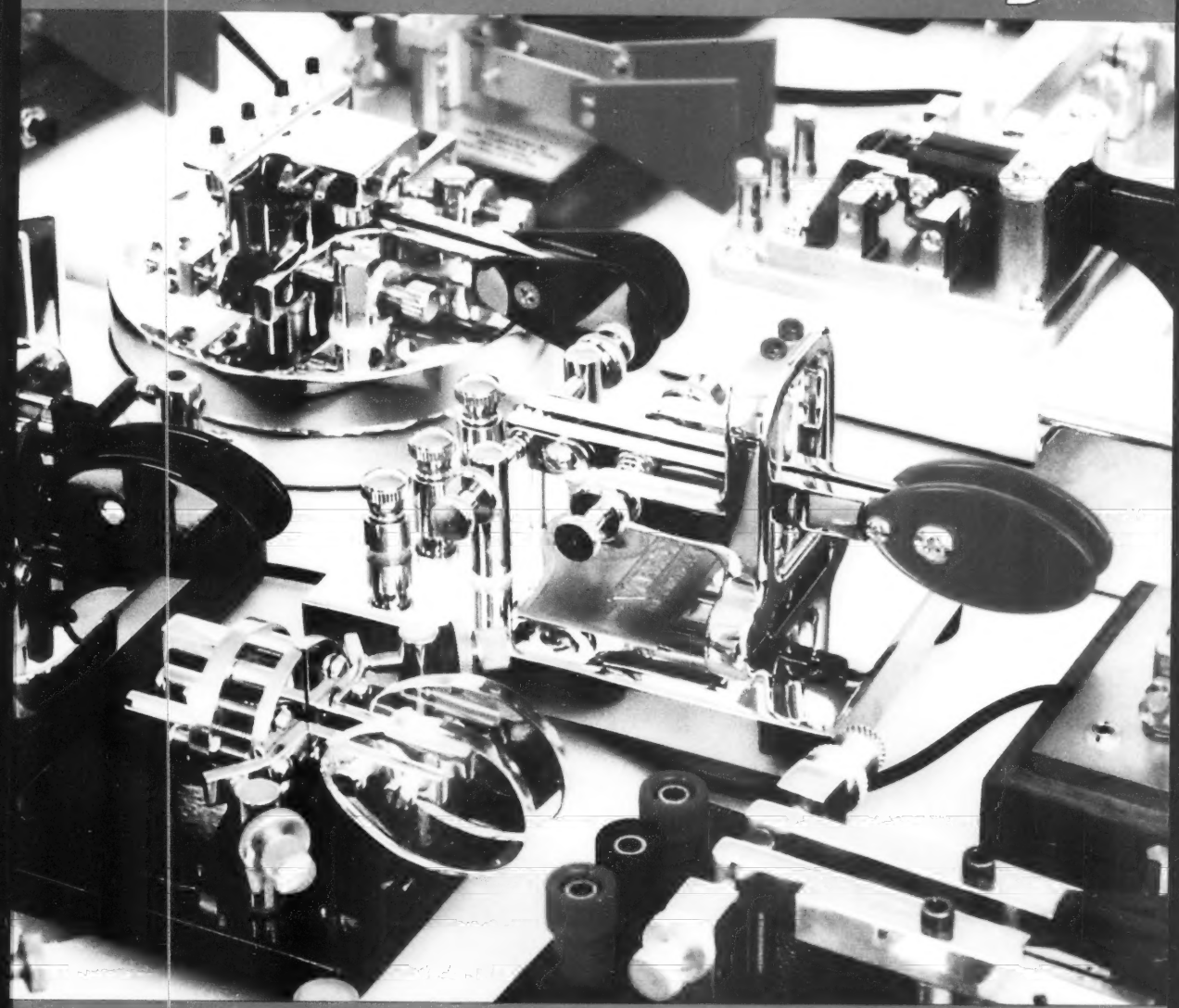

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LETTERS

Number 1 on your Feedback card

From the Hamshack

Robert E. Weimer W5DPO, Albuquerque NM I just recently bought a 2 meter handie-talkie. In the vernacular out here, I "jumped off." And, it was deja vu!

In the 1950s I was "rock-bound." Crystals cost $3.99 each from Allied Radio in Chicago. And, once you got your rig on the air and standing by for an opening in traffic, it was wait . . . and wait . . . and wait.

Later came the Citizen's Band, with 23 channels. Just like being rock-bound again. Wait . . . and wait . . . and wait.

Now we have 2 meters with repeaters. Just like being rock-bound. And it's wait . . . and wait . . . and wait.

While waiting after I programmed the HT, I could listen to some of the conversations and I was fascinated that it seems the longer the years, the less the change.

"Can you pass some emergency traffic?" "Yes." While waiting for the emergency traffic to come, another station came on the air to gush how nice it was to meet at the picnic, what a lovely time was had by all, and on and on. I wondered if the person who was waiting for the emergency traffic to be passed was bleeding uncontrollably. Later, I checked the *Callbook* and found that the gusher was an Extra class licensee—which sums up that technical knowledge does not always come with common sense.

David Satterfield WB7VET, Carson City NV I read David Cassidy's "Random Output" column calling clubs who restrict Technicians from using their repeaters "prejudiced," "self-inflated snobs," with "zealous hatred" and "regressive, bigoted ignorance." He agrees that it is perfectly legal for them to do whatever they wish with their equipment, but in the same breath he encourages us to go on a witch hunt for him and ferret out these clubs and their officers so that they may be placed in the stocks of *73*'s town square and exposed as evildoers, despoilers of amateur radio! Which brand of bigotry and zealous hatred is worse, his or theirs?

This is more of the "I have rights and you must accept me as I am" mentality that is so prevalent these days. Which, when translated, more often than not means "I want it all whether I earned it or not!" I'm surprised that some Tech or Novice hasn't sued the FCC because they restrict his freedom of speech on 80 meters! I myself am a Technician. I happily work code and only sometimes use VHF. I would not open a vein if I couldn't use a repeater because I was a Tech. I might go out and get my General, something that takes more effort than griping! I heard of a club in my Novice days that you could join only if you could copy 50 wpm or better. How unfair! How dare these bigots not let me join their club and use their gear? Didn't a study show that the inability to copy code over 10 wpm is due to the right and left hemisphere's being slightly out of synch? We're developmentally disabled! My lawyer is salivating.

Mr. Cassidy, the Constitution does not guarantee anyone happiness. It guarantees the RIGHT to PURSUE happiness. In the private world this means you must EARN the PRIVILEGES that guarantee happiness. Amateur radio is a hobby. If you want more from the hobby then get better at it. If these whining Techs want more, then either upgrade (effort), or join another club (no effort).

David—When you talk to me about the Constitution you're preaching to the choir, but intolerance of bigotry and prejudice cannot be labeled bigotry itself. I firmly believe that we are only entitled to what we earn, but that doesn't excuse those who consider themselves "better" because of race, religion or license class. If we apply your twisted logic to other forms of bigotry, your advice to a black man who is excluded from a country club is for him to "become white," or perhaps women should "become men" in order to attend a business lunch at an all-male club. Your argument presupposes that Technicians are lesser beings and should be treated as second class hams. Do you feel the same about other races, religions and sexes?

Any ham club that openly discriminates against certain license classes should have no problem with us advertising that fact. If they don't feel comfortable with us listing them as a discriminatory club, then they must obviously feel there is no justification for their discrimination. You see, if you shine a light on a cockroach it runs and hides. If they don't have any qualms about what they're doing, they shouldn't have a problem with us shining a light on them. Some things are just plain wrong and discrimination, for any reason, is one of those things . . . David N1GPH

Dean Sanderlin N9ILO, Waukegan IL Well Wayne, you can take at least partial credit for getting someone else up and doing something productive: me. After 18 years of repairing things electronic, mostly commercial two-way equipment, and doing it while working for somebody else, I finally decided to start doing it while working for myself, as my ad in "Barter 'n' Buy" will attest. It finally sunk in after coming home from a local hamfest with a sick computer, the one I'm writing this letter on, and having it up and running the same afternoon. I asked myself why, with all this experience, shouldn't I be using it for my own benefit, and for the benefit of those who could really use it? With all the new operators, I believe competent service will be in demand. I would also like to share my experience. Like Willard Shears W2IOS ("Letters," May 1992), I would like to be able to teach troubleshooting to these newcomers or, for that matter, to anyone else who would care to learn.

I am not a relative newcomer to amateur radio, as my call might indicate. If you have a '66 *Callbook* you might find my name next to WN9UYJ. True, there is a large gap there, but I never got too far away.

About your editorials, Wayne: They are what got me to get up and get my ticket again. They are also what got me to finally decide to take this step in self-determination. I thank you.

Josh Kelly NØNPI, Ft. Dodge IA During the past few months I have heard a number of comments about the language and content of the QSOs on HF. This is giving amateur radio a very bad reputation. This is also the reason I have never worked HF and probably never will (aside from the ridiculous CW requirement).

I have also heard about a lot of CBers who are NOT licensed amateurs on 10 meters, running the Radio Shack 10m mobiles. Last night I heard something that really made me mad. A couple of local CBers who were talking on 10m mentioned that they were both going to Radio Shack in the morning to buy 2m HTs.

Then there was the group that I heard about on 80m. A No-Code Tech was talking to a group about how he had just received his license the other day and how he refuses to learn the code. Basically, he was telling the FCC where to go. While I am against code, I DO NOT advocate this type of operation. Face it: The code requirement is there and, until this changes, we have to live with it.

As far as the illegal use of 2m HTs is concerned, I think we should have some way to limit the sale of amateur gear. Yes, it would be a big pain in the rear to have to prove that you have a license every time you purchase gear from a commercial vendor, but there are a lot of other things in the world that are an even bigger pain. Besides, it would only take two seconds to show the salesperson your ticket.

I can hear you all crying now, "But what about new hams, those who have passed the test and are waiting for their ticket to come in the mail?" If they have the certificate showing that they passed, then they could purchase equipment. Sure, people could lie, or use someone else's license, but it would cut down on the problems. I just hope those who aren't licensed but who purchase 2m HTs decide to take the No-Code test. It only takes a week or so of studying to pass it.

Andrew H. Kilpatrick WZ8A, West Chester OH Wayne, with regard to the Baxter problem, you are totally correct, of course, both with respect to the FCC and the ARRL.

For your information, after twice requesting the ARRL's position on K1MAN/IARN and then sending in a blank renewal form which also requested an answer, Dave Sumner finally sent me some two-year-old *QST* clippings which joyfully proclaimed that the ARRL was not part of the "controversy." The sad thing is that I will probably rejoin that operation just for the outgoing QSL bureau.

As to your suggestion of generating anti-IARN broadcasts on frequencies frequented by Baxter's multi-channel transmitters: That should be effective, and with just the information we already have on IARN, several hours of interesting broadcasting should be possible.

There is one small problem, however. I believe that such broadcasts, in order to be at least as "legal" as Baxter's, should be made by a legitimate amateur radio organization. Certainly if WGI were to sponsor such an organization, it would be many times more legitimate than IARN. In any case, let's say the organization is called "NRAI"—not to be confused with the NRA—and is chartered to stop broadcasting interference caused by amateurs on the amateur bands (NRAI = No Radio Amateur Interference). Broadcasts would begin prior to IARN diatribes and informal nets would be encouraged after each broadcast to discuss the broadcast material. Scheduled broadcasts would continue (emanating from Maine or New Hampshire) until egomaniacal broadcasts on the amateur bands are voluntarily discontinued, or are outlawed by some attorney-type political appointee who "works" for the federal government.

So how about it, Wayne? Would WGE sponsor the amateur radio information group, NRAI? (As sponsor, you can also select the name of your choice for the organization.) Please say yes, and I'll get the tape recorder rolling (I'm beginning to get that broadcaster's sense of power already!) and start looking for willing transmitters Down East.

Andy—It doesn't take much of an organization to be more legitimate than Baxter's IARN, which is made up largely of hubris emanating from Baxter. A name? Hmmm. Let's see . . . we might have the Radio Amateur International Network and RAIN on his parade. But if you're going to retransmit Baxter's bulletins you can do it as an official IARN news station . . . that's the Institute of Amateur Radio Network.

I originally formed the IAR in 1963 because we needed an official "organization" to contract for group travel. We took a group of 73 amateurs on a tour of Europe, with hamfests in London, Paris, Geneva, Rome and Berlin. We would have continued except for the ARRL's Incentive Licensing proposal to the FCC which brought the hobby to a screeching halt in 1964.

As the Secretary of the IAR I'd like to see cooperating radio amateurs improve Baxter's coverage by repeating his broadcasts . . . at least until such time as the IAR is able to provide endless information resources of its own.

If Baxter's transmissions are legal, then any repeating of them should be equally as legal . . . with appropriate identification as per Part 97. If our transmissions start before Baxter on 14.275, then K1MAN will be intentionally interfering with (jamming) our IARN broadcasts if he comes on.

The Institute is an honorary membership organization with no paid dues, so we're not soliciting any dues or donations . . . only service in the long-range interest of amateur radio . . . Wayne

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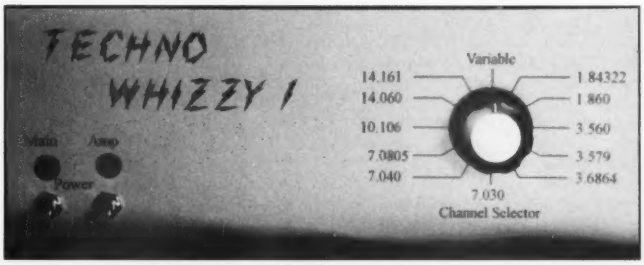

Build your own DDS radio . . . see page 8.

Cover: Keyer paddles from the collection of John Rehak N6HI.
Cover photo by Jim Mintum N7YVK.

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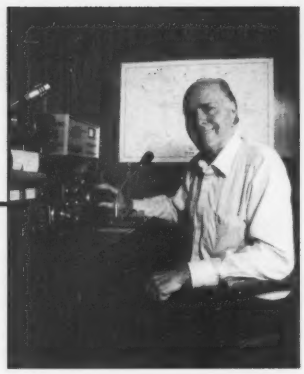
Audit Bureau of Circulations (ABC) membership applied for.

Contract: By merely glancing in the general direction of this miniscule message, you have just become legally obligated to the staff and management of *73 Amateur Radio Today* to introduce one young person to amateur radio within the next 30 days. Surely you have some youngster in your neighborhood, or perhaps a son, daughter or grandchild, who would be fascinated to learn about this hobby. It could be the greatest gift you could ever give them.

NEVER SAY DIE

Wayne Green W2NSD/1



Thoughts At 70

My wife took advantage of the bargain airfares, so we celebrated my 70th birthday in Alaska. Other than a couple-hour stopover in Anchorage, this was my first real visit to Alaska, so I was looking forward to it. More about that presently.

There was a chart in *Time* which showed the life expectancy for people according to their birth year. It turns out that when I was born my model was scheduled to last an average of 55 years, so I'm already 15 years into overtime. No wonder so many of my old Navy and college friends are dead.

Since there's no way to gauge how far this overtime thing can be pushed and I don't notice Willard Scott being overrun with centenarian announcements, I'm going to do my best to stay healthy and cause as much trouble as I can with whatever time I've got left.

The Ketchikan 79 repeater provided a QSO with three locals; two were heading out of town for the weekend. I tend to somehow run into things like that, so I'm used to it. The chap I really came to visit, Bob KL7NC, the publisher of *The Local Paper*, was there, so I was all set.

When Sherry asked if I was interested in going to Alaska I surprised her with a yes. When she asked where in Alaska, I answered Ketchikan. Ketcha-what? Well, it isn't as well known as Anchorage, Juneau, Valdez, Fairbanks, Sitka and so on, but dagnabit, it's the most visited city in Alaska, and that's where I wanted to go. So we went.

We arrived there on the evening of my 70th birthday. The next morning Bob picked us up and took us to one of the two radio stations for an interview. Then we drove a block to the other station for another. From there it was a two-block drive to the daily paper for a third interview. I talked about my new book, about amateur radio, music, and computers.

If you ever take a cruise to Alaska you'll spend half a day in Ketchikan. At least two cruise ships stop there every day during the summer, so they get over 300,000 visitors a year as a result. It's a town of about 13,000 during the summer and maybe 5,000 during the winter, with the rest heading south for more daylight and less rain.

Rain is the operative word. They average about six clear days a year, so I was very lucky to have two beautiful sunny days for my visit. They get 14 feet of rain a year. That's feet, not inches. I think there's one place on earth where they have slightly more rain. Oddly, they don't get much snow. The main industry is fishing, of course. There are a zillion fishing boats. Tourism is second, so the downtown area is almost wall-to-wall gift shops.

Most of the downtown is built on pilings. There just isn't much flat land around there. Many houses are built on the sides of hills and several "streets" are actually wooden stairs. The town is about two miles long and mostly one block wide, running along the water. It's on an island, so the roads don't go very far. The airport is on a neighboring island, with a small ferry connecting it to the town.

In the afternoon Bob organized a reception at my hotel, giving me a chance to meet more hams and some local politicians. In the evening we went to see a mellerdrammer put on by local non-actors. It had something to do with a fisherman who robbed local fish traps to put his daughter Little Nell through school. Why the villain wanted to marry her (she weighed in at around an eighth ton) I'll never know. She was in love with a Dudley Doright type of chap, who apparently hadn't given any thought to how much it would cost to feed his beloved. Inexplicably, the play has been running summers for 26 years.

The prices are about 50% higher than Seattle, but salaries apparently aren't. A one-day visit about covers things. This gets you to the fish hatchery and the totem pole museum. Hey, that's more than we have for visitors to Peterborough. We've got the McDowell Artist Colony and you're done. The totem poles were more interesting. Ever the entrepreneur, it made me want to get into the totem pole business. Well, I've now visited Alaska . . . and enjoyed it.

My visit to Ketchikan was a wonderful birthday present. Last year we went to Orlando and did Walt Disney World, Universal Studios and Epcot. A couple years before we went on a mystery train round trip between New York and Washington. We were in a club car with the actors while they put on a murder mystery, with the audience as part of the play.

At 70 I get to ski free at the New Hampshire state-run ski areas. And I'm drawing full Social Security benefits now, which is crazy. Other than that the benefits of lasting this long are few. It does tend to bring up the question of how much longer I can last. Both my folks lived to be 87, so I guess my genetic structure is sound. And when you consider that my father smoked until he was around 65, and suffered terribly from emphysema and other smoker's illnesses for the last few years, I might have a chance to beat his record. My mother died of Alzheimer's. If I see even the beginnings of that, I'll consult the book *Final Exit*. There's no way I'm going that route. Of course, if I'm able to put some fire under the medical industry and get them to change their whole basic approach to illness, I could be around for a while. I believe the key to eliminating all illness is within our grasp.

Bob and the people of Ketchikan made our visit a treasured memory. We thank them.

A Packet Newsletter

Paul Straney N2LSS has started a new packet newsletter you might want to check out. Issue #1 shows a good start, with six pages. The subscription price for this bi-monthly is $7 per year. Send Paul a buck for a sample copy (P.O. Box 167, Garrattsville NY 13342).

I'm a huge believer in ham newsletters as aids to the development of special ham interests. Back when *73* was first started we tried to help hamming grow with *6up*, a VHF newsletter, *5-7-9*, a CW-oriented newsletter, and a club bulletin supporting newsletter providing material to help club newsletter editors make their newsletters more interesting. Alas, these all blew away when amateur radio collapsed in 1964 as a result of the ARRL's Incentive Licensing proposals . . . the rule changes they proposed quickly put 85% of the ham dealers and manufacturers out of business within a year or two.

This also killed my growing ham kit business, where we were furnishing kits of parts to help readers build construction projects described in *73*. I bought the parts at Evans Radio in Concord, New Hampshire, and put them into kits for the readers, passing them along at about my cost in order to help them have fun building.

So let's support all of the special interest ham newsletters and help them grow. Help them get advertising and patronize their advertisers. Newsletters, like magazines supporting any new technology, provide needed communications between the hams developing new technologies. They also make it possible for newcomers to the interest to come up to speed fairly easily. And, most important of all, they make it possible for entrepreneurs to go into business providing products for the new technology and reach their potential customers quickly and inexpensively. Without these start-up firms you can't build a new industry.

When I started publishing *Byte*, back in 1975, this was my aim. I'd gotten the concept from the success I'd had in 1969-72 with supporting NFM and repeaters with my *Repeater Bulletin*, plus hundreds of articles in *73*. When the computer articles I was running in *73* were so enthusiastically received, I knew *Byte* was needed and would be a success.

So keep an eye peeled for ham newsletters and support 'em. Let me know if any interesting newsletters turn up that I may not know about. There are a couple out there being published by hams I consider crooks. I'm not going to waste money with lawsuits by naming them, but you may be sure I won't be recommending 'em. At my age I don't need the extra aggravation.

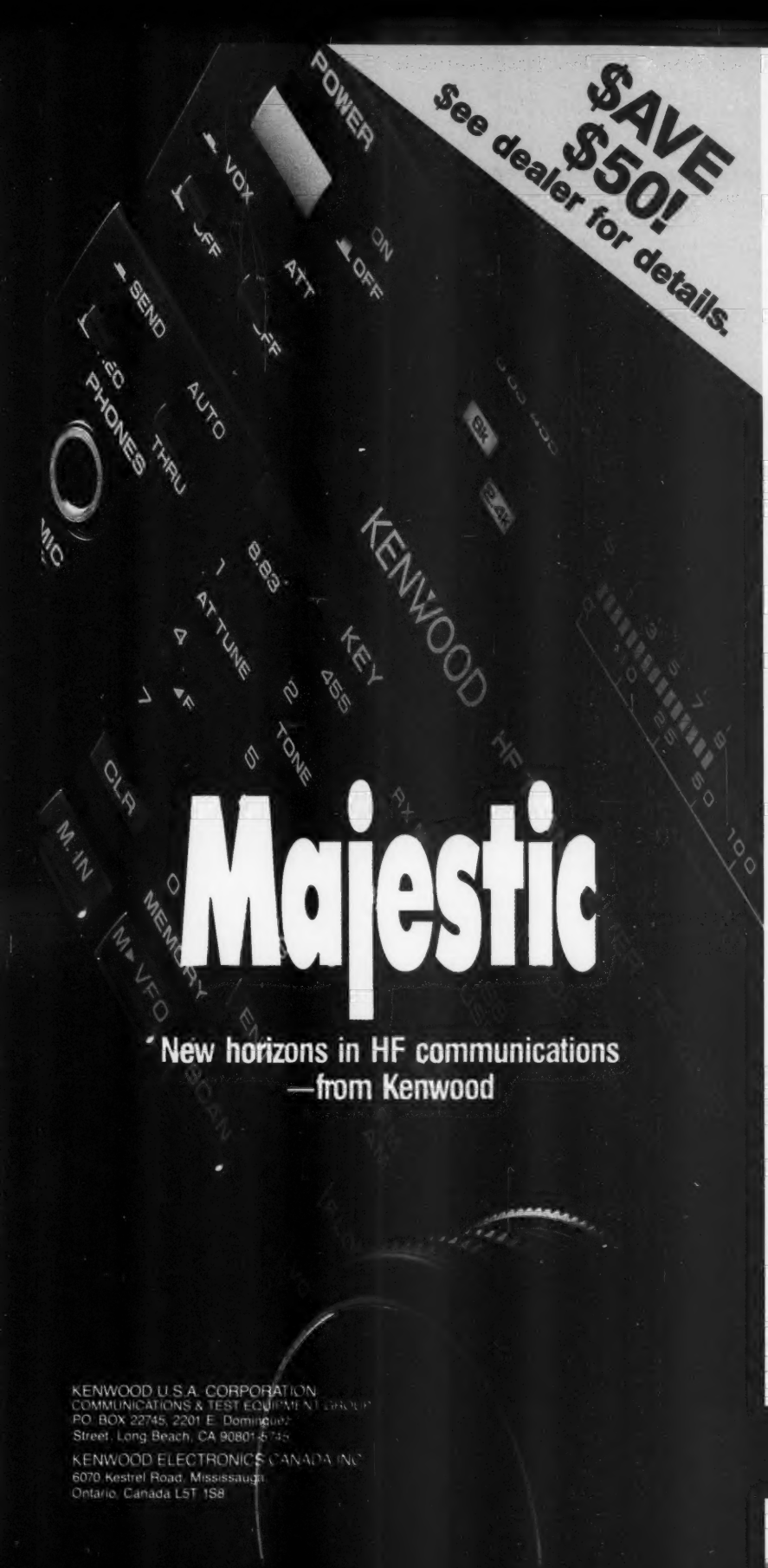
A Fatter Magazine

Would you like to see *73* twice as thick every month? Well, so would we. I know it's going to come as a humongous surprise to some readers when I let the cat out of the bag . . . the thickness of the magazine is proportional to the pages of advertising. It's that simple.

The time was when *73* had the most ads in the field. That was before IDG trashed it, making many major advertisers terminally angry. So why did I sell it in 1983? Because I had no choice. I was faced with either selling my publishing company, together with all my magazines, or being forced out of business by either IDG or Ziff . . . or both. That's what happens when the megapublishers come into a field.

So I sold everything and started fresh, building a whole new publishing business. That took a couple years. I had to hire and train a new staff, get a new building, put in new typesetting and production systems, and so on. I'd believed that I would continue to be the publisher of *73* for IDG, but I soon found myself locked out. They said the

Continued on page 86



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Majestic

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KENWOOD

...pacesetter in Amateur Radio

Kenwood's TS-450S is a triumph in transceiver technology. Covering all nine HF amateur bands—in SSB, CW, AM, FM and FSK modes—with powerful 100W output (40W for AM), it's ready to take the lead in all HF communications. Advanced features—with the option of adding a digital signal processor—give you the edge in performance. Yet the compact, lightweight construction makes it a winner for DX-peditions.

- **AIP system**
  Kenwood's exclusive AIP (Advanced Intercept Point) circuit raises the receiver's intermodulation dynamic range to 108dB, while lowering the noise floor level.
- **Superior interference reduction controls**
  IF shift, AF notch, dual noise blankers, CW reverse mode, and pitch control. IF filter settings can be stored in memory.
- **Ultra-fine tuning (SSB, CW and FSK modes)**
  By engaging the FINE key, the operator can tune precisely in 1Hz steps, thanks to the Direct Digital Synthesizer (DDS).
- **Automatic antenna tuner (built-in or option)**
  The internal antenna tuner can automatically establish the optimum match between 20 and 150 ohms in the 80 to 10 meter band. The optional AT-300 automatic external tuner covers 160-10m, and can also be used to tune single-wire antennas.
- **Optional digital signal processor**
  The DSP-100 provides signal modulation of unerring precision. In SSB operation, unwanted sidebands can be effectively suppressed, while in CW mode the rise and decay times of CW waveforms can be tailored for optimum clarity.

The TS-450S can be computer-controlled with the optional IF-232C and HamWindows software. See your Authorized Dealer for more details.

TS-450S
HF Transceiver

QRX . . .

Atlas Radio Returns

Herb Johnson W6QKI, whose innovative talents have brought many firsts to ham radio, is back in the marketplace once again. Herb has revived his well-respected Atlas Radio Company and has introduced a new high-quality, yet budget-priced, high frequency transceiver that just about any ham can afford. Priced at only $795, the Atlas 310 features a hot receiver with exceptional dynamic range and a 150-watt output transmitter designed for SSB, CW and digital modes such as packet and AMTOR on all nine bands. For more information, write to: Atlas Radio Co., 1556 Lower Lake, Cardiff CA 92007, or call (619) 944-9622. *TNX Westlink Report #635, October 12, 1992.*

IARU Region 2 Meeting Formally Recognizes HF Packet

The International Amateur Radio Union Region 2 Conference was held in Curacao August 31st to September 4th, 1992, and the decisions made will definitely have an impact on the future of high frequency fully automatic packet radio forwarding worldwide. The group adopted specific terminology to define digital communications as follows.

Digital modes ("digimodes") describe RTTY, AMTOR and packet (including new systems like PACTOR and CLOVER), but not FAX and SSTV; "packet priority" refers to band segments in which digital modes other than packet are permitted, but may not claim protection from packet. It was agreed that CW remains a permitted mode throughout all amateur bands. How to classify digital voice and image modes was left unresolved for the moment, as these were not burning issues and the task at hand was difficult enough.

The joint committee then recommended, and the plenary adopted, band plans for the digital modes as follows.

80 meters: 3.580-3.635 MHz digital modes; 3.620-3.635 MHz packet priority.

30 meters: 10.130-10.150 MHz digital modes; 10.140-10.150 MHz packet priority.

20 meters: 14.070-14.0995 MHz digital modes; 14.095-14.0995 MHz packet priority; 14.1005-14.112 MHz CW/phone/ packet shared (note 1 kHz guard band centered on 14.100 MHz for the NCDXF beacon network). This is a great improvement for packet operation, which under the previous band plan had been limited to below 14.0995 MHz—a limitation that had a lot to do with RM-7248 being shot down. The Region 3 band plan has shown packet to 14.112 MHz since 1988, and the Region 1 band plan has followed suit only since May of this year.

17 meters: 18.100-18.110 MHz digital modes; 18.105-18.110 MHz packet priority.

15 meters: 21.070-21.125 MHz digital modes; 21.090-21.125 MHz packet priority.

12 meters: 24.920-24.930 MHz digital modes: 24.925-24.930 MHz packet priority.

10 meters: 28.070-28.189 MHz digital modes; 28.120-28.189 MHz packet priority.

Because of widely differing patterns of usage, the joint committee was unable to come up with a plan for 40 meters that everyone could agree to. But there was a compromise proposal offered by Ecuador. Under the compromise, 7.040-7.050 MHz would be used for "international packet" while 7.100-7.120 MHz would be available for packet use within Region 2.

There will be some problems implementing this 40 meter approach. Novice activity and the 200-watt power limit that applies to this segment, but we viewed it as a step in the right direction and did not object to adoption of the compromise by the plenary. *TNX Jerry Williamson KC6LHA; Westlink Report #635, October 12, 1992.*

HF Digital Accord Reached in Dallas

Representatives of those amateurs using unattended low-band forwarding under the STA met with the American Radio Relay League's Digital Committee in Dallas to see if an agreement could be worked out, which would result in a proposal to the FCC to allow continued operations after the current STA runs out. The present Special Temporary Authority, issued by the FCC to demonstrate the practicality of such a system, is scheduled to expire December 31st. Since the ARRL's position was to file for "semi-unattended" operation, the packet wizards protested loudly that such a rule change in place of the STA would kill the utility of the network. The following is the ARRL press release issued September 29, 1992:

On September 26 the ARRL Digital Committee met in Dallas with five representatives of the present HF automatic-forwarding STA networks, to discuss ways to continue the existing forwarding networks while protecting the interests of other users of the bands. The participants noted the IARU Region 2 digital band plan which was adopted September 4 in Curacao. This international agreement opened the door to reconsideration of recent recommendations of the Committee to the ARRL Board of Directors.

The committee recommends that the part of the IARU Region 2 band plan providing for digital forwarding be incorporated into the U.S. regulations. The ARRL board will consider this recommendation as a potential petition for rule making to the FCC. The committee also recommended that the ARRL request an extension of the current STA for the period during which new rules are under consideration.

In concert with the recommendation, which would allow automatic operation while providing rules to protect nonautomatic users of the bands, the group formulated a tentative voluntary band plan for the digital parts of the MF and HF bands. Interested parties are encouraged to comment on the tentative band plan, which will be made widely available.

The participants agreed that the changing nature of the digital state of the art requires that periodic review of national and international band plans be made. The committee pledges to work with all segments of the digital community to suggest such changes to the band plans as may be needed in the future.

TNX Westlink Report #635, October 12, 1992; ARRL Bulletin 93.

Cited for Language

The FCC has cited an amateur for "indecent speech" on the 20 meter band. On September 23 the Commission announced a Notice of Apparent Liability (NAL) for $2,000 had been sent to Allen Burton KA4URC of Hornbeak, Tennessee, alleged for willful violation of FCC Rule 97.113(d), which prohibits transmission of indecent words and language on amateur radio stations.

Burton, 60, is a General class licensee. According to the NAL, on the afternoon of June 29, 1992, the Commission's Kingsville, Texas, office monitored a conversation on 14.300 MHz which included KA4URC. "We find," the NAL said, "that the words and language transmitted are indecent within the meaning of Section 97.113(d) and prevailing Supreme Court and Commission precedent."

"We find that the transmissions describe sexual acts and organs in a patently offensive manner and go well beyond what an average adult person in any community would consider to be worthy of protection," the Commission said.

The NAL said one of the Commission's goals is to "protect children from exposure to sexually explicit communications over the airwaves," and noted here that "the transmissions were made in the summertime in the afternoon when there is a real likelihood that children are listening." An ARRL survey of young radio amateurs was used as corroboration.

Burton was fined less than the $5,000 that Commission guidelines would have allowed because it was his first offense and because he is an individual rather than a corporation (such as a broadcast radio or television station). Burton has 30 days in which to pay the fine or to explain why it should be reduced or not imposed. *TNX The M.A.R.C. News, October 1992.*

TNX . . .

. . . to all our contributors! You can reach us by phone at (603) 924-0058, or by mail at *73 Magazine,* Route 202 North, Peterborough NH 03458. Or get in touch with us on CompuServe ppn 70310,775; MCI Mail "WGEPUB"; or the 73 BBS at (603) 924-9343 (300-2400 bps), 8 data bits, no parity, one stop bit. News items that don't make it into *73* are often put in our other monthly publication, *Radio Fun.* You can also send news items by FAX at (603) 924-9327.

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- **Wide dynamic range** - resist overload
- **Stable:** low-feedback dual-gate FET

**Specify tuning range: 26-30, 46-56, 137-152, 152-172, 210-230, 400-470, 800-960 MHz.*

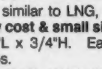
LNW-(*) MINIATURE PREAMP

ONLY $29 kit, $44 wired&tested

- GaAs FET Preamp similar to LNG, except designed for **low cost & small size.** Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

**Specify tuning range: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, 400-500 MHz.*

LNS-(*) IN-LINE PREAMP



ONLY $89 kit, $119 wired&tested

- GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W. Tower mounting brackets incl.

**Tuning range: 120-175, 200-240, or 400-500.*

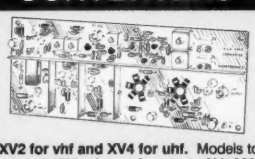
HELICAL RESONATOR PREAMPS

- GaAs FET preamps with 3 or 4 section helical resonators **reduce intermod & cross-band interference** in critical applications. **MODEL HRG-(*), *$80 vhf, $110 uhf.*** **Specify tuning range: 142-150, 150-162, 162-174, 213-233, 420-470.*

RECEIVING CONVERTERS

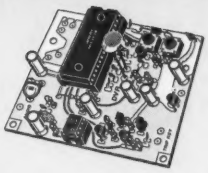
Low noise converters to receive vhf and uhf bands on a 10M receiver.
- **Kit less case *$49*, kit w/case & BNC jacks *$74*, w&t in case *$99*.**
- Input ranges avail: 50-52, 136-138, 144-146, 145-147, 146-148, 220-222, 222-224 MHz, 432-434, 435-437, 435.5-437.5, and 439.25 (to chan 3).

TRANSMITTING CONVERTERS



XV2 for vhf and XV4 for uhf. Models to convert 10M ssb, cw, fm, etc. to 2M, 220, 222, 432, 435, and atv. 1W output. ***Kit only $89.*** PA's up to 45W available.

ACCESSORIES



NEW **DVR-1 DIGITAL VOICE RECORDER** Module. Primarily a **voice ID'er for repeaters**. May also be used as a **contest CQ caller** or as a **"radio notepad"** to record up to 20 seconds of received transmissions for instant recall. As a **repeater ID'er,** it will record your voice, using either the built-in microphone or an external mic. It can be used with almost any repeater COR module. As a **contest caller,** you can record a message or even several messages and play them through your transmitter at the press of a switch. As a **radio notepad,** you can keep it wired to the audio output of a receiver ready to record up to 20 seconds of anything you might want to recall later. Play it back as many times as you like through a small external speaker. (Call for more information.) .....kit $89, w&t $139

TD-3 SUBAUDIBLE TONE DECODER/ENCODER. Adjustable for any tone. Designed **especially for repeaters,** with remote control activate/deactivate provisions ....kit $29, wired & tested $69

COR-3 REPEATER CONTROLLER. Features adjustable tail and time-out timers, solid-state relay, courtesy beep, and local speaker amplifier ..... kit $49

CWID. Diode programmed any time in the field, adjustable tone, speed, and timer, to go with COR-3 ..... kit $59

COR-4. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call ..... kit $99, w&t $159

TD-2 TOUCH-TONE DECODER/CONTROLLER. Full 16 digits, with toll-call restrictor, programmable. Can turn 5 functions on/off. Great for selective calling, too! .....kit $89, wired & tested $149

NEW **TD-4 SELECTIVE CALLING** Module. Economy touch-tone decoder with 1 latching output. Primarily designed to mute speaker until someone calls you by sending 4-digit tt signal but may also be used to turn on autopatch or other device..... kit $49, w&t $89

AP-3 AUTOPATCH. Use with above for repeater autopatch. Reverse patch and phone line remote control are std. .....kit $89, wired & tested $149

AP-2 SIMPLEX AUTOPATCH Timing Board. Use with above for simplex operation using a transceiver ..... kit $39

MO-202 FSK DATA MODULATOR. Run up to 1200 baud digital signals through any fm transmitter with full handshakes. Radio link computers, telemetry gear, etc. ..... kit $49, w&t $79

DE-202 FSK DEMODULATOR. For receive end of link. ..... kit $49, w&t $79

9600 BAUD DIGITAL RF LINKS. Low-cost packet networking system, consisting of MO-96 Modem and special versions of our 144, 220 or 450 MHz FM Transmitters and Receivers. Interface directly with most TNC's. Fast, diode-switched PA's output 15 or 50W.

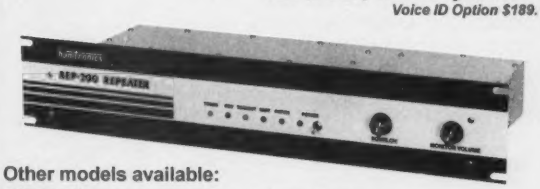
NEW **Real-Speech Voice ID Option Available With DVR-1 Digital Voice Recorder Shown At Left!**

REP-200 REPEATER

A microprocessor-controlled repeater with autopatch and many versatile dtmf control features at less than you might pay for a bare-bones repeater or controller alone!

We don't skimp on rf modules, either! Check the features on R144 Receiver below, for instance: GaAs FET front-end, helical resonators, sharp crystal filters, hysteresis squelch.

Kit $1095; w&t only $1295!
Voice ID Option $189.



Other models available:

REP-200V Economy Repeater. As above, except uses COR-4 Controller without DTMF control or autopatch. **Kit only $795, w&t $1095.**

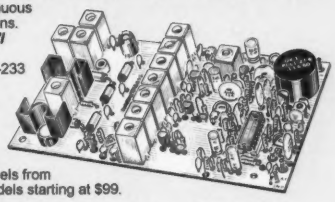
REP-200N Repeater with no controller. For use with external controller, such as those made by ACC. **Kit only $695, w&t $995.**

- Available for the 50-54, 143-174, 213-233, 420-475, 902-928 MHz bands.
- *FCC type accepted for commercial service (hi-band and uhf).*
- **Rugged exciter and PA**, designed for continuous duty.
- Power out 20W 50-54MHz; 15W (25W option avail.) 143-174MHz; 15W 213-233 MHz; 10W uhf; 10W 902-928MHz.
- Available add-on PA's **up to 100W.**
- **Six courtesy beep types**, including two pleasant multi-tone bursts.
- **Open or closed access autopatch, toll-call restrict**, auto-disconnect.
- **Reverse Autopatch,** two types: auto-answer or ring tone on the air.
- Pulse (rotary) dial option available.
- **DTMF CONTROL:** over 45 functions can be controlled by dtmf command. 4-digit control code for each function.
- **Owner can inhibit** autopatch or repeater, enable either open or closed access for repeater or autopatch, and enable toll calls, reverse patch, kerchunk filter, site alarm, aux rcvr, and other options.
- Cw speed and tone, beep delay, tail timer, and courtesy beep type **can be changed at any time** by owner password protected dtmf commands.
- **Auxiliary receiver input** for control or **cross linking repeaters.**
- Many **built-in diagnostic** and testing functions using microprocessor.
- Color coded **LED's indicate status** of all major functions.
- **Welded rf-tight partitions** for exciter, pa, receiver, and controller.
- 3½ inch aluminum rack panel, finished in eggshell white and black.

XMTRS & RCVRS FOR REPEATERS, AUDIO & DIGITAL LINKS, TELEMETRY, ETC.

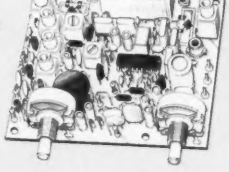
Also available in rf-tight enclosures, and with data modems.

FM EXCITERS: 2W continuous duty. TCXO & xtal oven options. ***FCC type accepted for com'l high band & uhf.***



- **TA51**: 50-54, 143-174, 213-233 MHz ...kit $109, w&t $189.
- **TA451**: 420-475 MHz ...kit $109, w&t $189.
- **TA901**: 902-928 MHz, (0.5W out); w&t $219.
- **VHF & UHF AMPLIFIERS.**
- For fm, ssb, atv. Output levels from 10W to 100W. Several models starting at $99.

FM RECEIVERS:



- **R144/R220 FM RECEIVERS** for 143-174 or 213-233 MHz. **GaAs FET** front end, 0.15uV sensitivity! Both crystal & ceramic if filters plus **helical resonator** front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere!) Flutter-proof hysteresis squelch; afc tracks drift. ...kit $149, w&t $219.
- **R451 FM RCVR,** for 420-475 MHz. Similar to above. ...kit $149, w&t $219.
- **R901 FM RCVR,** for 902-928MHz. Triple-conversion, GaAs FET front end. ...$169, w&t $249.
- **R76 ECONOMY FM RCVR** for 28-30, 50-54, 73-76, 143-174, 213-233 MHz, w/o helical res or afc. ...Kits $129, w&t $219.
- **R137 WEATHER SATELLITE RCVR** for 137 MHz. Kit $129, w&t $219.

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  Send $2 for overseas air mail.
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CIRCLE 57 ON READER SERVICE CARD

The Techno-Whizzy 1, Part I

Build a direct digital synthesis (DDS) radio.

by John Welch N9JZW

I've grown tired of the same old designs being rehashed over and over again. I wanted something new, something state-of-the-art, but my wallet balked at paying over $2,000 for a new rig. Nobody offered a cheap Direct Digital Synthesized (DDS) radio but, folks, it is not only possible to design one, it is both fun and easy.

No, it doesn't have *all* the bells and whistles yet. What it does offer is a chance to build a DDS radio of your own, for a lot less than buying a whole new rig. It's modular, so as I (or you) design new boards they can be added to the basic unit without throwing out all your work. I call it the TW-1, for Techno-Whizzy, model 1.

The TW-1 is a modular multiband CW QRP transmitter, using a new Direct Digital Synthesis (DDS) chip from Qualcomm (1055 Sorrento Valley Rd., San Diego CA 92121; Tel: (619) 597-5005). It has 11 diode-programmable channels and one dip switch variable frequency channel, and it puts out 2 watts from 1 MHz through 21.5 MHz (that's 160 meters, 80 meters, 40 meters, 30 meters, 20 meters, 17 meters and 15 meters, FULL COVERAGE, plus many MARS and CAP bands to boot). With some modifications to the amplifier stage it can even cover the 1750 meter Experimenters Band. I'm planning to eventually add a receiver board, a linear amp, a doubler to get full HF coverage, a digital signal processor to handle SSB and a digital frequency display with keypad input.

Instead of a VFO, the heart of this transmitter is the new Q2220 DDS chip from Qualcomm. It runs at 55 MHz clock input, and has a 24-bit phase accumulator. In English, this means that the minimum frequency change is 55,000,000 / 2^{24} (two raised to the 24th power), or just about 3 hertz. Above 1/8th the clock frequency, the quality of the output signal falls off, but tight filtering can remove the harmonics. Between 1/3 and 1/2 the clock frequency is the maximum output frequency you'll get without a *lot* of fancy filters. I've designed the TW-1 to run at any frequency from 3 hertz to over 21 MHz in 3 Hz steps while maintaining a decent sine wave output to the amplifier. With the additional filtering after the amplifier, it's FCC legal—the spurious emissions are all more than 30 dB down as measured on a spectrum analyzer.

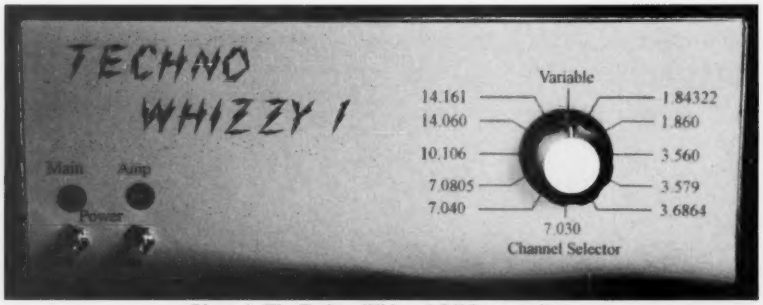


Photo A. The Techno-Whizzy 1 DDS transmitter.

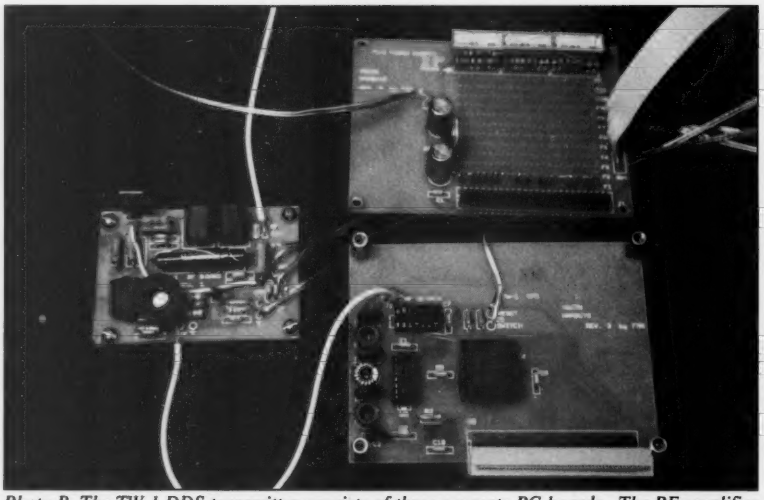


Photo B. The TW-1 DDS transmitter consists of three separate PC boards. The RF amplifier is shown on the left, the diode matrix for frequency selection is shown at the upper right and the DDS synthesizer board at the lower right.

How It Works

The frequency is set using pull-up resistors and diodes. The input to the Q2220 chip is binary (don't panic—I'll explain this later), with 1's being a 5-volt input and 0's being grounded inputs. There is a line of pull-up resistors, one for each input line, and a place to install pull-down diodes. When you select a channel, it grounds the cathode end of that row of diodes, pulling those lines low.

The Q2220 reads the input lines from the frequency selection board 55 million times a second (once per clock cycle), and adds that value to its current value in the phase accumulator. (If the result is larger than 2^{24}, it subtracts 2^{24} from it to keep the phase angle between 0 and 2^{24}). This number, expressed as a percent of 2^{24}, tells the DDS how far around a circle it currently is. It then calculates the sine at that position, and outputs the sine's value to the Digital-to-Analog Converter (DAC).

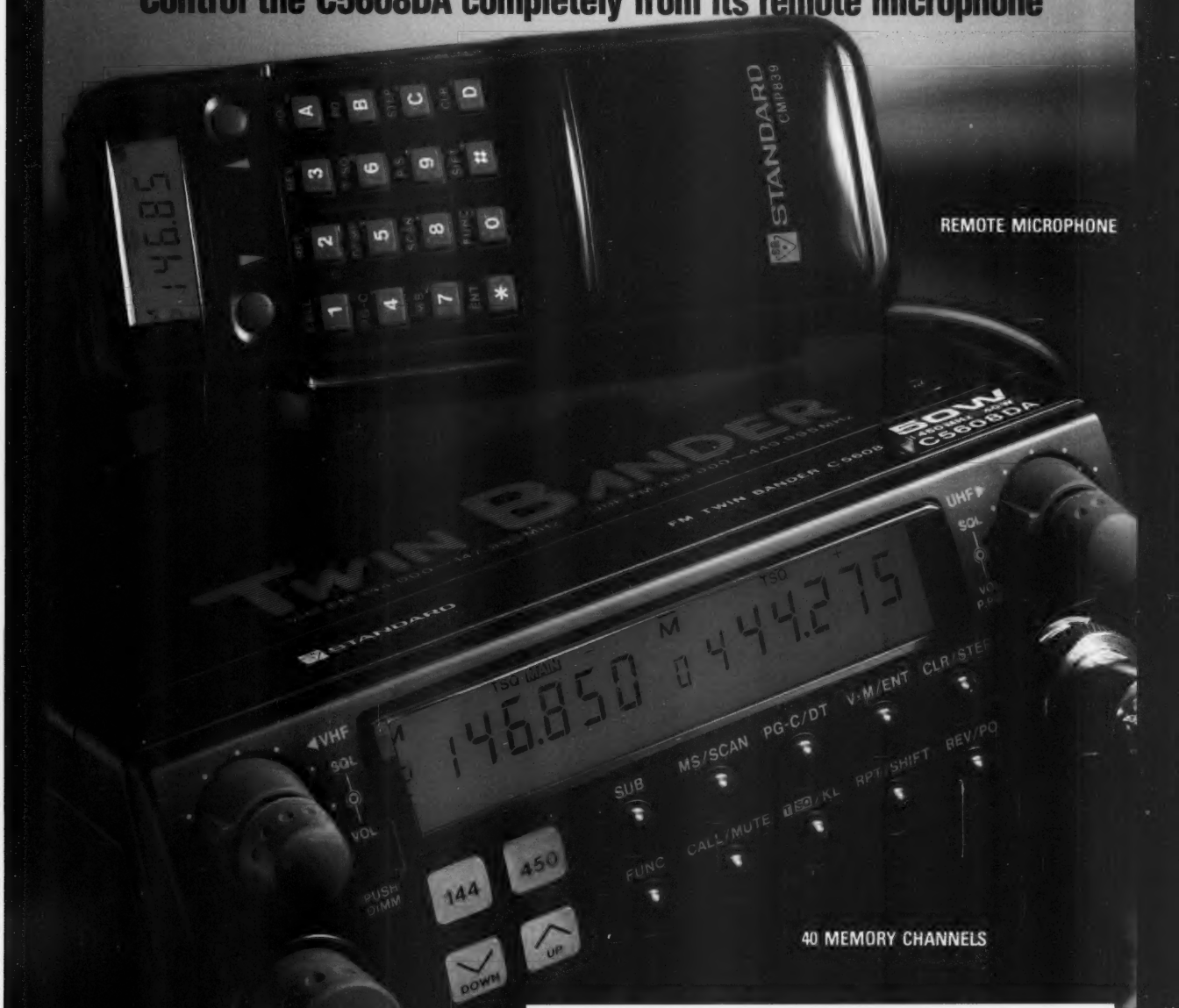
The DAC then takes this value and translates it into a voltage between DC and 1 volt. At this point, the signal doesn't look like a sine wave—it looks like a staircase with up to 256 steps built on a sine wave. To remove the "staircase," the signal is passed through a seven-pole low-pass filter that cleans it up. The now-clean sine wave (at 2 milliwatts) is sent to a low-level class A linear RF amplifier.

If the key is on, power is applied to the class A driver amplifier, which then amplifies the signal to 80 milliwatts and passes it to the final amp. The final runs class A also, for maximum linearity (after all, if you've gone through all the trouble of making a clean sine wave, why mess it up with a nonlinear amp?). The final outputs 2 watts into a 50-ohm load (either a dummy load or your antenna).

Switching to another frequency is easy; just turn the channel knob. The DDS chip reads the new value, and starts all over from

STANDARD®

New C5608DA True Twin Band Mobile Transceiver
Control the C5608DA completely from its remote microphone



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there. It takes six clock cycles for this change to be seen at the driver stage, which is about 120 ns—so fast it's effectively instantaneous. There are no adjustments to tweak, no guessing where you are—just *click* and you're there. That's the joy of a digital rig!

How to Set the Frequency

Okay, now for the hard part—math! With the simple setup this rig has, you do have to do some pencil work. It's not hard, and you can even cheat two ways—I've included a table of several standard QRP frequencies and there's BASIC source code for a program to compute the frequency if you have a computer.

Keep in mind that there is a difference between repeatability and absolute accuracy. This rig is repeatable—a channel is always on the same frequency it was last time. It can also be accurate, but you'll have to measure the output frequency of your particular oscillator. Mine was 55.001 MHz or so at room temperature. If you want accuracy, use your exact oscillator frequency instead of 55 million in the following calculations. Note: The table was designed using 55 million—it'll be close to the correct frequency and repeatable, but not absolutely accurate.

Remember earlier where I said the DDS has a 24-bit phase accumulator, and runs at 55 MHz? The size of a step, then, is 55 million divided by 2^{24}. To get the radio on your desired frequency, divide your frequency by that step (55000000/16777216, or 3.2782555). Convert this number to binary—use a scientific calculator, computer or a 13-year-old computer nut for this. The number must have 23 digits—if you're short a few, put 0's at the *LEFT* side until you have 23 digits.

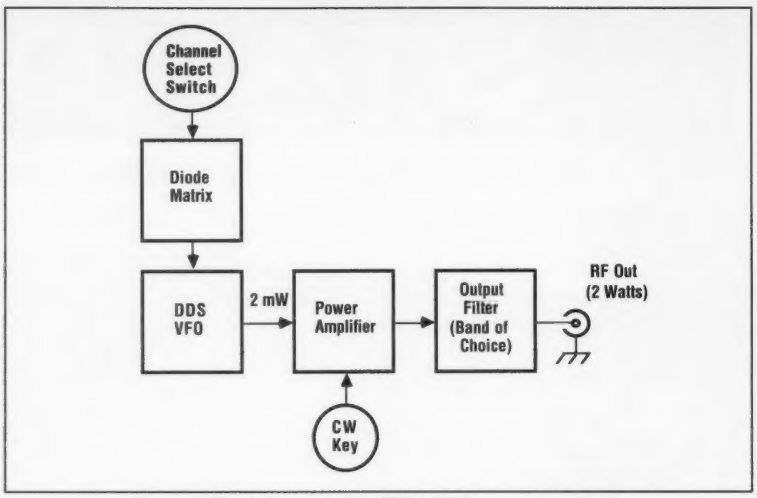

Figure 1. Block diagram of the TW-1 DDS transmitter circuit.

Pick an unused switch position and find the line of holes for that channel (they're numbered starting from F1 at the ribbon cable back to F11 near the resistor packs). Counting from left (nearest the power supply) to right, at every place you had a 0 put in a diode (1N914s will work fine) with the cathode (the banded end) in the air and the anode through the hole. Leave any spot that had a 1 empty. Run a wire tying all the cathodes together, and run that wire into the hole nearest the silk-screened "F??" label for that channel. When you switch the channel selector to that channel, the diodes conduct, pulling those lines to ground. The lines without diodes remain at 5 volts.

For example: If you want to set the TW-1 to 7,040 kHz on channel 1, take 7040000/3.278555 = 2147483. Converting this to binary gives you 010 0000 1100 0100 1001 0110. You would put a diode in holes 1,3,4,5,6,7,10,11,12,14,15,17,18,20 and 23. (See Figure 6 for details). If you wanted this frequency on the DIP switch channel (chan-

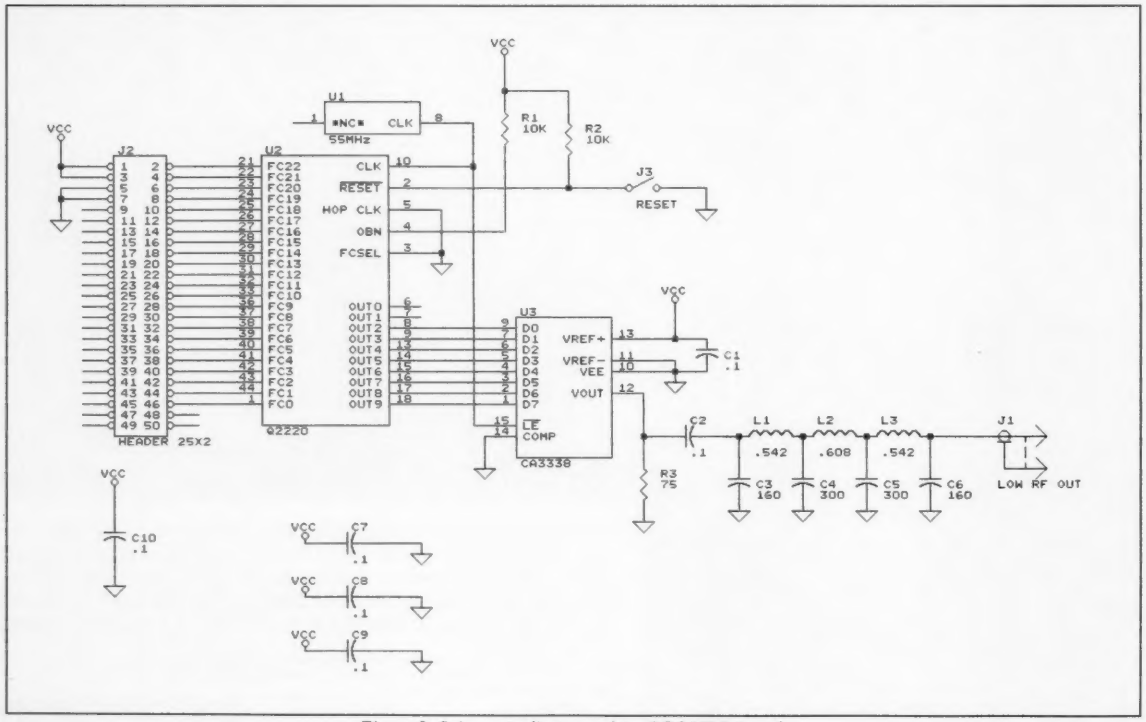

Figure 2. Schematic diagram of the DDS VFO board.

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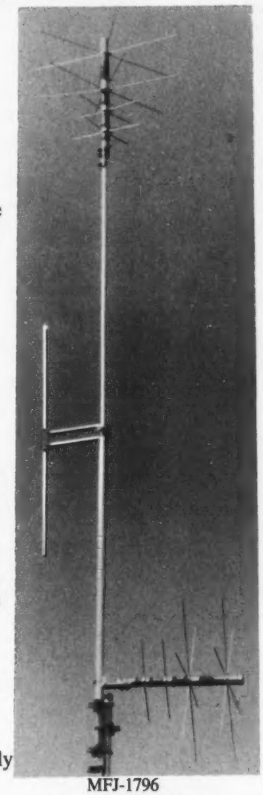

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nel 12), for any digit that was a 0 turn the switch ON. This will pull those lines to ground when you select channel 12.

Doing 7030 kHz gives 2144433, or 010 0000 0110 1000 0110 0001 in binary. 10.106 MHz gives 010 1111 0000 1001 1111 0001 in binary. For other values, see the chart on p. 18 showing some common QRP frequencies. If you don't like the math and need a different frequency, I've written a program you can use (see the program listing on p. 18).

Construction

Take a tip from me—use a fine-tipped low-wattage soldering iron for these boards. The pins sometimes have traces running between them, so keep a keen eye out for solder bridges and cold solder joints. When you're done soldering, nip off the leads close to the boards. This keeps things looking neat and will prevent accidental shorts when you assemble the boards into a chassis.

Build the power supply and frequency selector board first. Install the DIP switches and their diodes first, with the banded ends of the diodes tied together to the hole near the DIP switches. Set the DIP switch (channel 12) to 7,040 kHz (see above). Attach the 12-position channel switch to a short length of ribbon cable, with the common connection on the red wire. Run this cable to the 13 holes at the right side of the board, with the red wire at the top. Bend one set of pins on the resistor packs horizontal (or use individual resistors—I did), and put the resistor packs on the board with the horizontal set of leads in the holes and the other set in the air. Run a bare wire from the JUMPER hole across the pins in the air, soldering to each pin. Install the 50-pin header, being careful of shorts. Make sure you have the 7805 and the electrolytic caps in correctly. Check all connections for shorts and bad solder joints. When you're satisfied with your work, apply 12 volts to the power supply. You should have 5 volts at the jumper; if not, check your wiring.

At the holes marked FF (for Frequency, Future), you should read 5 volts on holes 2,8,9,13,16,19,21 and 22. Holes 1,3,4,5,6, 7,10,11,12,14,15,17,18,20 and 23 should be at ground (0.7 volts or less). Remove power from the board and it's functional!

Next, build the DDS board. Install U1, the clock oscillator, first. The mounting is designed to allow either a 14-pin-sized oscillator or an 8-pin-sized oscillator. Pin 1 is the same for either, but the 8-pin-sized oscillator is shorter and only reaches to the first set of holes. A 14-pin-sized device covers the middle set of holes, and installs in the second set of holes. If you want to socket this chip, use a 14-pin socket but remove the unused pins. Also, install the jumper wire from U1 to U2 now.

Install the socket for the DDS chip (U2) next. Make sure the socket matches the outline, with pin 1 facing up and the angled corner in the upper left. Install U3, the DAC, and the 50-pin header. These parts all have wires between pins, so be very careful when soldering them.

I socketed U3, and ran into phase jitter problems that were cured by adding two extra bypass caps soldered directly to the pins on U3. I added a 1.0 µF cap between pins 16 and 14, and another between pins 13 and 11. For best results, these should be tacked in either on the chip or under the board, but keep the leads as short as possible for good bypassing.

Install the filter next. L1 and L3 are 12 turns on a T37-2 (red) core and L2 is 14 turns on a T37-6 (yellow) core. For those who are new to this, a "turn" is any time the wire goes through the hole. (A bobby-pin on a core would be one turn.) Once you have these wound, spread the turns out to cover

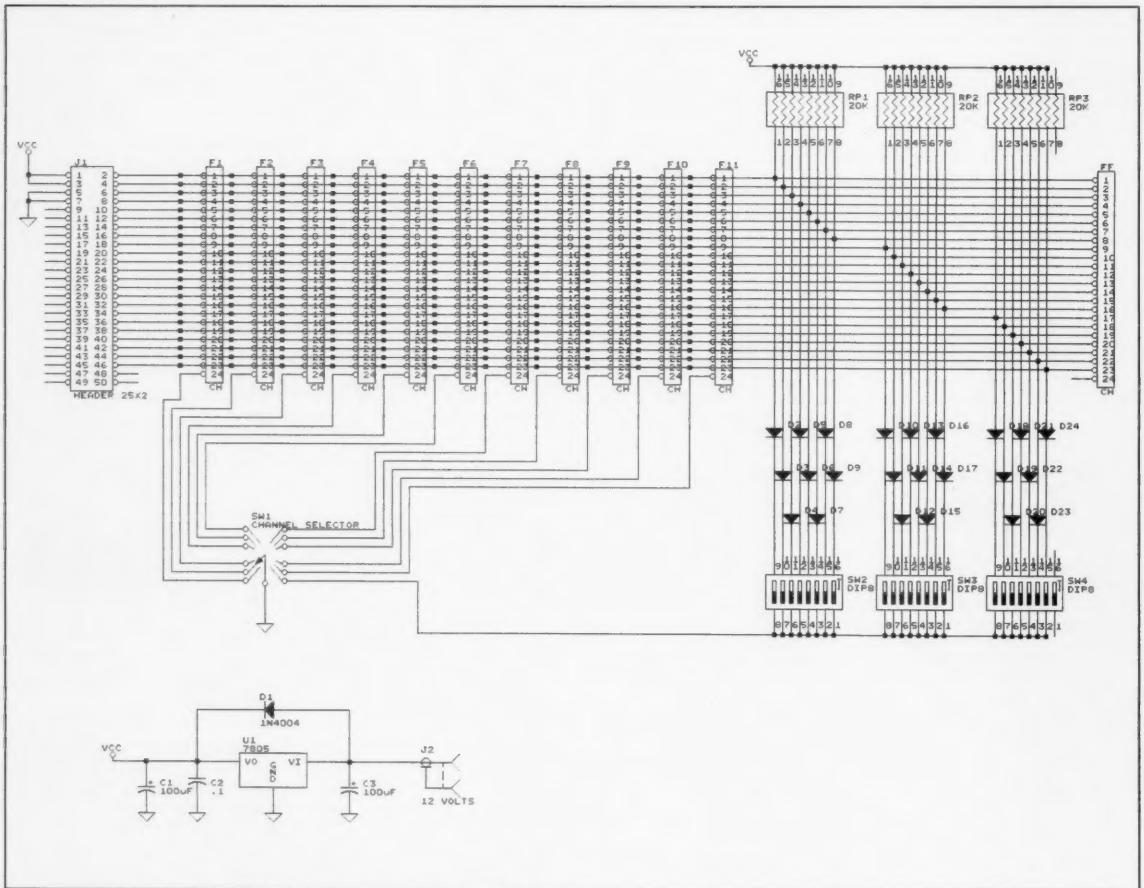

Figure 3. Schematic diagram of the diode matrix frequency selection board and power supply.

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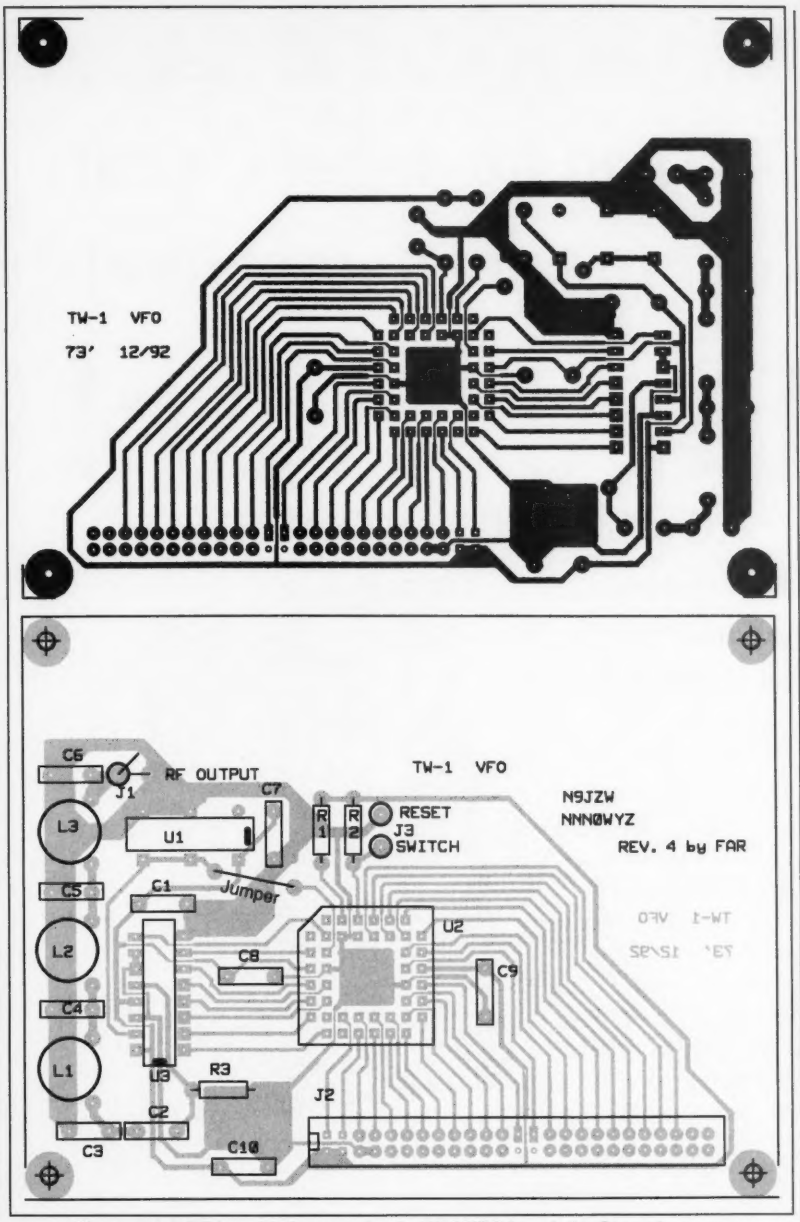

Figure 4. (a). PC board foil pattern for the DDS VFO board. (b). Parts placement.

three-quarters of the core, then cover the cores in plastic model cement. Make sure you remember which core is which!

Install the remaining resistors and capacitors in their proper places. Solder a short (5" or so) length of RG174 coax cable to J1, with the center connected to the trace going to L3 and the braid connected to ground (the other hole). Solder another short hunk of two-conductor wire to J3, and put an SPST Normally Open momentary switch at the other end. This is the RESET switch, which resets the DDS chip. You'll probably never use this, so it can go on the back of the case.

Attach the DDS board under the power supply board, leaving a small gap. Mounting holes have been provided at each corner for this. Make the ribbon cable to connect the first board with the DDS board. Pin 1 is on the left side, and should be the red stripe on the cable.

Check all work carefully, because we're going to give it a trial run now. With the DIP switches set to 7,040 kHz as above, connect the two boards with the ribbon cable. Set the channel switch to 12. Connect power to the power supply board. You should get 5 volts at pin 1 of U1. The input lines on the 50-pin header should be the same as they were when you tested the power supply board. Remove power—we're ready for a live test!

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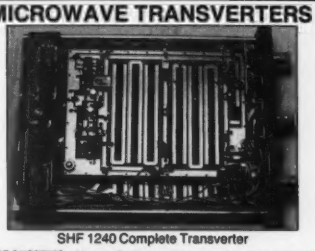

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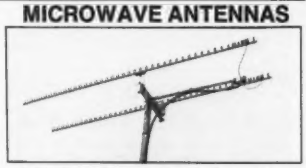

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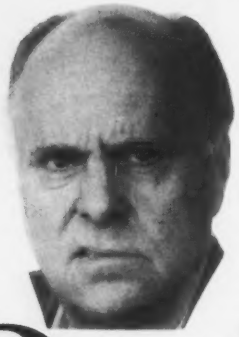

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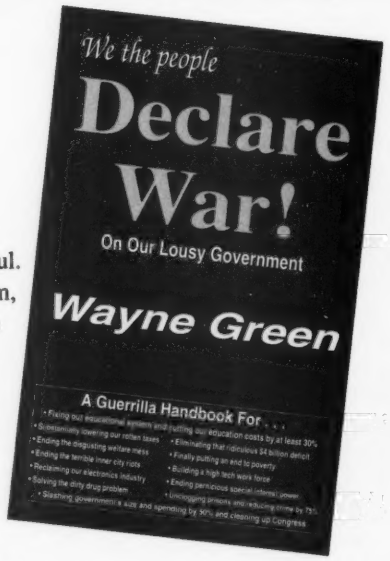

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3	QRX
4	Techno-Whizzy 1, Part I
5	Unlocking the HTX-100
6	Review: ICOM IC-728
7	Review: Micro Mag Mobile Antenna
8	Is 2 Meters Hazardous to Your Health?
9	Build a LiTZ Decoder
10	Iambic Keyer Paddles
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The Techno-Whizzy 1, Part I

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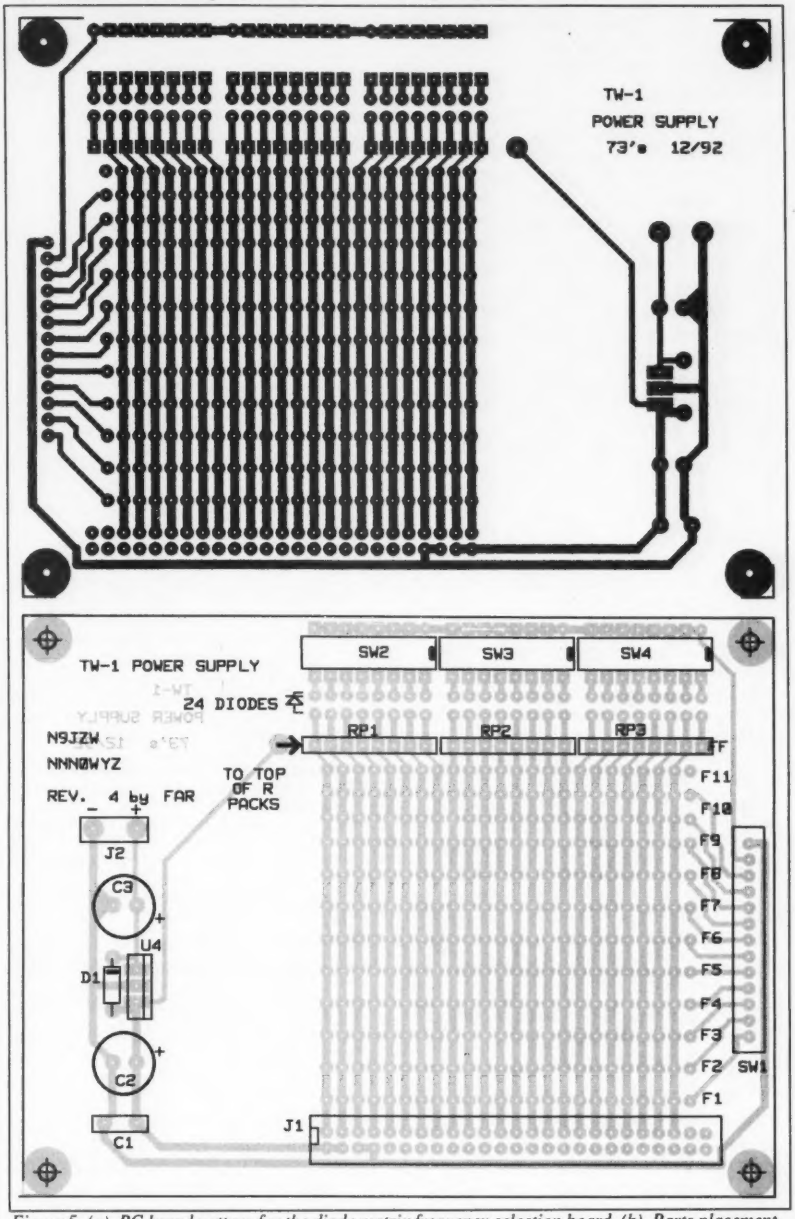

Figure 5. (a). PC board pattern for the diode matrix frequency selection board. (b). Parts placement.

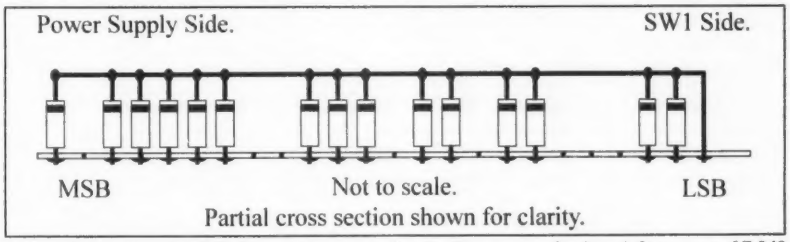

Figure 6. An example of diode array programming for frequency selection. A frequency of 7.040 MHz is shown. The view is from the front side of the frequency select/power supply board.

Continued on page 18

Install the chips in the sockets. Be especially careful installing U2! Removing this chip requires a special tool to prevent damage, so make sure it faces up! You should be able to read the chip number if you have the 50-pin header at your lower right.

Temporarily solder a 51-ohm resistor across the free end of the RG174. Hook a frequency counter to the hot end of the 51-ohm output resistor. Once again, apply power. You should have 7,040 kHz coming out of the unit. If so, congratulations! You've just built a basic DDS VFO!

If it didn't work, check for power on pin 1 of the ribbon cable. If there's power, check for +5 on pins 4 and 16—2,6,8,10,12,14 should be ground. If these aren't right, check the ribbon cable and connectors.

If there's power to the VFO board, look at the inputs to the DAC (U3 pins 2-9). These pins should be changing very fast. If they aren't, re-check the soldering on U2, check for clock signals out of U1 and try pressing the RESET switch. If the signals work while you press RESET, you've got a Normally Closed switch.

If the inputs to the DAC are changing, look for output. If there's no output, the chip may be in backwards or dead. If there's a signal at the output of U3, all that's left is the filter and the cable. Check these, and repair as necessary.

Now that you have a functional VFO, hook up a scope to the output. You should have a 0.7-0.8-volt peak-to-peak sine wave that looks pretty clean. Unplug the power, remove the 51-ohm resistor from the RG174 coax and you now have a very useful signal source and test generator.

Next month in Part II, we will turn this low-level (2 milliwatt) signal into something a little more useful by adding a 2-watt amplifier which should make this into a very capable QRP rig.

Some Common QRP Frequencies for the TW-1

Frequency (MHz)	Set TW-1 diode array to: MSB					LSB
1.810	000	1000	0101	1100	1011	1011
1.84322	000	1000	1001	0100	0101	0000
1.860	000	1000	1010	1000	0100	1111
1.900	000	1000	1101	0111	1111	1001
3.54025	001	0000	0111	1010	0101	1111
3.560	001	0000	1001	0001	1111	0111
3.579	001	0000	1010	1000	1001	1011
3.6864	001	0001	0010	1000	1001	0100
7.030	010	0000	1011	1000	1011	0001
7.040	010	0000	1100	0100	1001	1100
7.0805	010	0000	1111	0100	1101	1110
7.110	010	0001	0001	1000	0000	0100
10.106	010	1111	0000	1001	1111	0001
14.060	100	0001	0111	0001	0101	0010
14.161	100	0001	1110	1001	1011	1100
18.074	101	0100	0010	0000	0101	0010
21.060	101	0010	0000	0101	0101	0100

Put diodes, banded end up, wherever there is a 0 (zero).

Parts List

DDS VFO Board

C1,C2,C7,C8, C9,C10	0.1 µF ceramic	
C3,C6	160 pF silver mica	
C4,C5	300 pF silver mica	
J1	Low RF out	
J2	50 pin-header (25 pins by 2)	Digi-Key# 923876-R-ND
J3	Reset switch, SPST (Normally ON) momentary	
L1,L3	0.542 µH, 12 turns #26 enameled wire on T37-2 toroid	
L2	0.608 µH, 14 turns #26 enameled wire on T37-6 toroid	
R1,R2	10k ohm, 1/4 watt	
R3	75 ohm, 1/4 watt	
U1	55 MHz oscillator module	Digi-Key# SE1109
U2	Q2220 DDS by Qualcomm (See note below)	
U3	CA3338AE DAC by Harris	Digi-Key# CA3338AE
1	44-pin PLCC socket for U2	Digi-Key# A417-ND
1	If needed	1 µF ceramic between pins 16 & 14 of U3
1	If needed	1 µF ceramic between pins 11 & 13 of U3
1	Ribbon cable connector	Digi-Key# ASC50T-ND

Diode Matrix Frequency Selection & Power Supply

C1,C3	100 µF 25-volt electrolytic	
C2	0.1 µF	
D1	1N4004	
D2,D3,D4,D5,D6, D7,D8,D9, D10,D11,D12, D13,D14,D15, D15,D16,D17, D18,D19,D20, D21,D22,D23,D24	1N914	
J1	50-pin header (25 pins by 2)	Digi-Key# 923876-R-ND
J2	12 volts in	
RP1,RP2,RP3	20k ohm, 1/4-watt R-packs or 20k, 1/4 watt individual resistors	Digi-Key# 761-3-R20K
SW1	Channel selector 1P12T rotary switch	Digi-Key# EG1952-ND or GH5601-ND
SW2,SW3,SW4	8-position DIP switches	Digi-Key# A5208-ND
1	50-pin ribbon cable connector	Digi-Key# ASC50T-ND
U1	7805 voltage regulator	
Misc.	—	1N914 for setting channels

A complete kit of parts (including the PC boards) is available from Elktronics-NE, Rt. 1 Box 789, Hancock NH 03449, Tel: (603) 525-4001. Prices as follows: *DDS VFO module* — $99; *Diode Matrix module* — $49; *Power Amplifier module* — $49; *Output Filter module* (specify band)— $10. *A complete package of all modules* — $199. The Qualcomm Q2220 DDS chip can be ordered separately for $39. All prices include postage/handling.

Etched and drilled PC boards for this project are also available separately from FAR Circuits, 18N640 Field Court, Dundee IL 60118. Pricing: *DDS VFO PC board* — $8; *Diode Matrix* — $8; *Power Amplifier* — $6; *Output Filter board* — $3. Please add $1.50 per order for shipping.

The Q2220 (as well as data sheets) is also available directly from Qualcomm, 10555 Sorrento Valley Rd., San Diego CA 92121; (619) 597-5005, for $49, but they have a $150 minimum order.

The CA3338A, the 55 MHz clock oscillator and most of the small parts are available from Digi-Key; (800) 344-4539.

Toroids are available from Amidon Associates or KA7QJY Components (Danny Stevig), Box 3893, Logan UT 84323; Tel: (801) 563-5173.

Basic Program to Determine Diode Array Placement for a Given Frequency.

```
10 REM tw1-freq.bas  by n9jzw  nnn0wyz  9-24-92
20 REM program computes the layout of the binary array of diodes for
30 REM setting the tw-1 to a given frequency
40 REM load the hex-to-binary conversion table
50 DIM binary$(16)
60 FOR x = 1 TO 16
70 READ binary$(x)
80 NEXT x
100 REM set the clock speed and number of bits of phase accumulator
110 clock = 55000000
120 phase = 24
130 REM set the maximum step rate
140 fstep = 2 ^ phase
150 REM compute max frequency  (MHz) that still has 3 steps per cycle
160 max = (.4 * clock) / 1000000
170 PRINT "Maximum frequency is"; max; "and minumum frequency is .0001"
180 INPUT "Enter the frequency in MHz (eg 7.040 = 7040KHz) -->"; freq
190 IF freq < .0001 GOTO 170
200 IF freq > max GOTO 170
210 REM compute the frequency setting in decimal
220 setting = (freq * 1000000) / (clock / fstep)
230 REM now in binary...
240 diode$ = "000000000000000000000000"
250 temp$ = HEX$(setting)
260 FOR x = 1 TO LEN(temp$)
270 temp1$ = MID$(temp$, x, 1)
280 IF temp1$ < "A" THEN 300
290 temp1$ = STR$(10 + ASC(temp1$) - ASC("A"))
300 temp = VAL(temp1$)
310 diode$ = diode$ + binary$(temp + 1)
320 NEXT x
330 PRINT "Put diodes, banded end UP, in the positions which have 0s:"
340 PRINT RIGHT$(diode$, phase - 1)
9000 DATA "0000","0001","0010","0011","0100","0101","0101","0111"
9010 DATA "1000","1001","1010","1011","1100","1101","1110","1111"
9999 END
```

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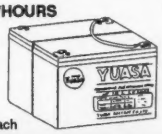

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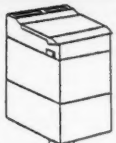

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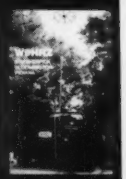

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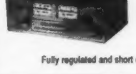

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The Key to Unlocking the HTX-100

by Edward Oros AC3L

One of my favorite radios is Radio Shack's HTX-100. I've had a lot of fun working DX from my car with this rig. It is also one of the easiest to modify, if you want to unlock the RIT.

One of the major drawbacks with a rig of this class (HR-2510, HR-2600, HTX-100) is the tuning. There are usually four-step sizes used when tuning to the desired frequency (500 kHz, 10 kHz, 1 kHz and 100 cycles). The 500 kHz step is rarely used; its main purpose is to move you from one part of 10 meters to another. For example, if you are in the CW portion of the band and want to move to the SSB end, this switch is handy. The 10 kHz step tuning can be used when looking for contacts, but you skip over most of the band. The 1 kHz step isn't too bad, but if the other station is 1/2 kHz off frequency you'll have to switch over to the 100-cycle tuning. Even then, the station may be 50 cycles off from you. I always find myself using the 10 kHz step to find a section of the band with activity, then switching to the 1 kHz step to pick out a "loud one," then switching again to the 100-cycle tuning to fine-tune the person in. Many times I still can't get the station in just right, and there just isn't any other way to get any closer to their frequency! Sure, you can use the rig's RIT control to tune your receiver right on, but then your transmit frequency is still off a bit since it doesn't move with the RIT control!

The Conversion

What's the answer? A simple modification to allow the transmit frequency to move in sync with the receiver frequency when using the RIT control. This mod takes only a few minutes, is reversible (in case you change your mind later) and really makes the radio a pleasure to use afterwards.

There are only two parts to this conversion. You'll need a 6-inch piece of wire and a 10k variable resistor. Any 10k pot should work fine.

To begin the conversion, first place the radio on a flat SOFT surface (the cases of these rigs seem to scratch easily) with the speaker side down, and place the rig so the front is facing you. Remove the top four cover screws and the top cover. Locate the radio's lamp light, and follow the white leads down to the green circuit board. Notice that one of the lamp's leads is connected to a point on the board marked +8. Now look on the circuit board to the right of the +8 point. You should see a white jumper plug. In front of this and slightly to the left is a printed circuit board trace line. It is a straight line with a solder point on each end. If you have a voltmeter take a voltage reading from this trace against the chassis ground. It should read near 7 volts. Mark down this number.

Next, disconnect the power from the radio. Take the 10k variable resistor and solder the center tap lead of the resistor to the board at the +8 solder point. Next take the 6-inch wire and solder it to either of the two remaining leads of the variable resistor. Use a sharp tool to break the straight line trace that you just found. Cut it in the middle of the line if possible. Then solder the free end of the 6-inch wire to the end of the trace closest to the front of the radio. The existing end solder point works nicely for this. This trace line originally provided voltage only during receive. Since the 8-volt source that we are now tapped into is there during both receive and transmit, the control will now change frequency in both cases.

Connect the antenna and power but do not replace the cover yet. Now you have to reset the radio back on frequency. To do this, you can use a frequency counter, or a local ham. Set the RIT (now RIT/XIT) to the center OFF position and adjust the 10k resistor to set the radio on the correct frequency. Have your ham friend transmit on a pre-determined frequency while you set the resistor to tune them in. Another method would be to use the voltage reading that you took earlier—you can just check the center tap of the resistor now and set the pot to the original voltage and you will be close to the correct frequency. Once back on frequency replace the cover, screws, antenna and power. At this point, let me inject a word of warning, your frequency display WILL NOT CHANGE as you use this new RIT/XIT. So be careful around the band edges, don't get too close or you may actually be out of band!

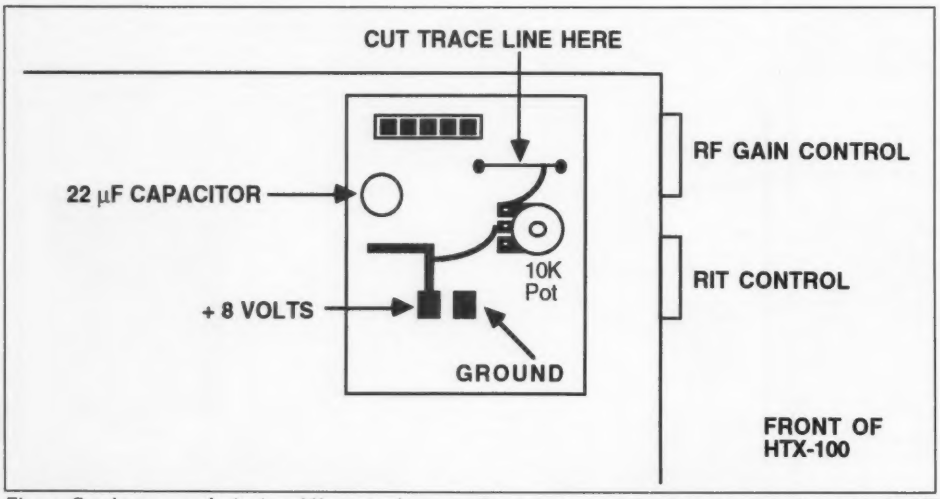

Figure. Cut the trace and wire in a 10k pot as shown to allow your transmit frequency to track along with the RIT control.

Now you're ready to see how much easier the rig is to operate. With the RIT unlocked, I generally leave the step size set to the 1 kHz position, tune close to a "loud one" and then just use the RIT/XIT for the final touch up. You get about 1-1/2 kHz on each side of the control's center. It's great! Have fun and I'll see you on 10 meters! 73

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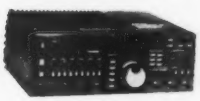

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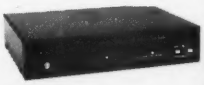

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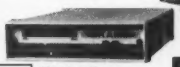

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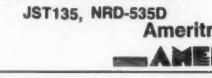

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Price Class: $1,099

Top-of-the-line performance in an inexpensive package.

When I first had the chance to operate a new IC-728, I looked at it as an inexpensive and plain radio without many of the bells and whistles found on top-of-the-line transceivers. However, after a few days of use I was so impressed by its ease of operation and the high quality of the receiver that I felt that this affordable transceiver could definitely hold its own when compared with top-of-the-line radios.

The ICOM IC-728.

Features

The IC-728 has all the features I feel are necessary to effectively operate on today's busy bands: pass-band tuning; a very effective noise blanker; a switchable receiver preamp; a 20 dB receive attenuator; variable AGC; RIT; 10 Hz readout; an RF power level control; a speech compressor; and a microprocessor that is smart enough to handle memory, frequency, mode, and other operations properly.

There is no digital keypad, built-in keyer, individual controls for noise blanker width, audio tone, or odd configurations of RIT on the IC-728. However, what few controls it does have are logically laid out on the front panel.

Fortunately, ICOM wasted no money on a manual notch filter for the IC-728. After all, everyone knows that I say, "Get an automatic notch filter—it'll be the best money you ever spent for an accessory!"

Operations

The manual, although small in size, contains the necessary information required for proper operation and use of all features of the IC-728. Additionally, instructions are given for many maintenance operations and adjustments. An excellent owner/operator troubleshooting chart is part of the manual. One flaw of the manual is the sometimes lack of in-depth explanations for control settings.

The tuning knob has a good feel and serves the dual purpose of frequency change and band change. The rate of tuning can be speeded up by pushing a switch and the dial weight can be changed by adjusting a tension screw on the front panel. A 10 Hz readout is selectable.

The VFO operation is typical of most current solid-state rigs. A and B can be selected, A can be equal to B, and split operations are possible. Memory and VFO information are interchangeable. When you QSY from one band to another, the mode and frequency last used will be stored/recalled for the band left/chosen.

Modes (SSB/CW/AM/FM) are selected by push-button; however, it should be noted that to operate AM transmit and any FM, the IC-728 requires installation of an optional UI-7.

The PBT (pass-band tuning) works as expected; this feature is required on today's crowded bands.

There are 26 memory channels selectable by UP and DOWN front panel switches and various SCAN configurations can be set up. Mode selections are included in the memories.

The standard (included) microphone has UP and DOWN switches for lazy-man tuning. The condenser element and circuit are typical.

Semi-break-in CW with adjustable hold is standard; CW filter(s) are not. Optional plug-in filters of 250 or 500 Hz bandwidths are available.

The RF output power level is fully adjustable from 10 watts to 100 watts (CW and SSB). The meter displays RF relative output and received signal strength (S-meter).

LEDs indicate XMIT and RX (when the squelch is opened). The squelch can be used in all modes. The XMIT LED doubles as an ALC indicator by changing brightness.

The rear panel of the IC-728 has a number of accessory sockets that are not generally found on other comparable XCVRs. Outputs/inputs include: switched 13.8 VDC, audio (fixed level), squelch, tuner information, AFSK, ALC, amplifier switching, etc.

Computerized operation is afforded through an optional CT-17 CI-V Level Converter with speeds to 9600 baud.

How It Performs

The IC-728's receiver is triple conversion and uses direct digital synthesis. It is both sensitive and quiet—very quiet! ICOM has really perfected DDS (direct digital synthesis).

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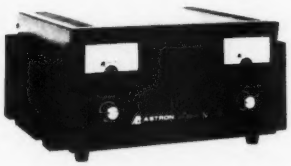

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SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD except for RS-3A
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• LOW PROFILE POWER SUPPLY						
SL-11A	•	•	7	11	2¾ x 7⅞ x 9¾	11

RS-L SERIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE				
RS-4L	3	4	3½ x 6⅛ x 7¼	6
RS-5L	4	5	3½ x 6⅛ x 7¼	7

RM SERIES MODEL RM-35M

• 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

receiver the IC-728 provides. In performance it is comparable to my trusted Ten-Tec Corsair II and outperforms my IC-751A hands-down. I don't make this statement lightly, as both have been standards to which all others have been compared.

Selectivity and sensitivity both rate very high. Weak signals on 10 meters were copyable, and the very crowded 75 meter band at night was easily sorted out. Using the PBT made signal sorting very easy.

Note: This evaluation was completed during the summer months when QRN is very prevalent. I found that the IC-728 handles high levels of static very well.

Receive audio was very good, even when using the internal speaker. It improved, however, when I sent the audio to a large external speaker (as would that of nearly any receiver).

Comments about the XMIT audio quality were not as positive as those about receiver performance. Audio was described as weak and without authority. I corrected this by changing from the standard microphone to the SM-8 (ICOM) and making tone adjustments to it. I was then able to duplicate my typical IC-751A or Corsair II signal, and comments were then very favorable.

A keypad, such as the one optionally available for the IC-751A, would be a good addition. I rarely use memory features, but I do enjoy the ease of keypad frequency entry. Perhaps a third party will develop a workable solution to this deficiency.

The display is very readable and the controls are well laid out for ease of operation. The switches and controls are large enough to be easily usable.

The size of the IC-728 is such that it will easily fit in most mobile situations. An automatic antenna tuner would be perfect for this operation.

For the evaluation I used an Astron 35-amp power supply, as the IC-728 does not have a built-in AC power supply. The antennas I used included the Cushcraft R5, a two-band dipole, and a 160 meter Carolina Windom.

Recommendation

The ICOM IC-728 performs top-of-the-line and is operationally comparable to the high-priced rigs, but the price is way-down-low.

I recommend the IC-728 and feel confident the investment will be returned with many years of reliable enjoyment.

Model IC-729

ICOM foresaw the recent demand for 6 meter transceivers by adding coverage from 50 to 54 MHz to the IC-728 and calling it an IC-729.

Six meter power output is 10 watts on SSB/CW/FM and 4 watts on AM. A tone encoder is included. The 729 weighs about 10.8 lbs. and costs about $300 dollars more than the IC-728.

Specifications

General
Receive frequency coverage:
500 kHz-30 MHz
Transmit frequency coverage:
1.800- 1.999 MHz
3.500- 4.000 MHz
7.000- 7.300 MHz
10.10- 10.150 MHz
14.00- 14.350 MHz
18.068-18.168 MHz
21.000-21.450 MHz
24.890-24.990 MHz
28.000-29.700 MHz
Modes: SSB/CW/AM*/FM*
(* AM and FM require optional UI-7 on IC-728)
Memories: 26
Antenna impedance: 50 ohms
Usable temperature range: 14 to 140 degrees F
Frequency stability:
<±200 Hz first hour
<±30 Hz at 77 degrees F
<±350 Hz over 90 degree F fluctuation
Power requirement: 13.8 VDC (20 A on XMIT)
Dimensions: 9.5 x 3.7 x 9.4 inches (WHD)
Weight: 10.1 lbs.

Transmitter
Output power
1.8-30 MHz
SSB/CW/FM:100W
AM: 40W
Spurious emissions: <-50 dB
Carrier suppression: >40 dB
Unwanted sideband suppression: >50 dB
Microphone impedance: 600 ohms

Receiver
System: Triple conversion superheterodyne
IF frequencies: 70 MHz/9 MHz/455 kHz
Sensitivity (preamp on):
0.5-1.8 MHz
AM <13.0 µV/10 dB S/N
1.8-30 MHz
SSB/CW <0.16 µV/10 dB S/N
AM <2.0 µV/10 dB S/N
FM (28-30 MHz) <0.5 µV 12 dB SINAD

Selectivity:
SSB/CW
>2.1 kHz/-6 dB
<4.0 kHz/-60 dB
AM
>6.0 kHz/-6 dB
<20 kHz/-40 dB
FM
>12 kHz/-6 dB
<30 kHz/-50 dB
Spurious and image rejection: 70 dB
Audio output: 2.6W at 8 ohms
RIT range: ±1.2 kHz

Options Available
AM/FM Unit (UI-7) is required for AM transmit and FM operation in the 10 meter band.
ICOM offers an automatic antenna tuner (AT-160) which attaches to the side of the IC-728. It receives its operating power from the 728.
For mobile operation the AH-3 HF Automatic Antenna Tuner is available. This particular tuner is designed for remote mounting (ie: in the trunk).
An automatic antenna selector (EX-627) is also offered that switches antennas based upon the frequency of operation. Manual over-ride is included.
Many other options are available (see your local dealer or send to ICOM for more information).

Availability
The ICOM IC-728 is available from most amateur radio sales outlets. The suggested retail price is $1,099 although the street price will probably be less.

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COM-3, the world's most popular low-cost service monitor. For shops big or small, the COM-3 delivers advanced capabilities for a fantatic price—and our new lease program allows you to own a COM-3 for less than $3.00 a day. Features •Direct entry keyboard with programmable memory •Audio & transmitter frequency counter •LED bar graph frequency/error deviation display •0.1–10.000 µV output levels •High receive sensitivity, less than 5 µV •100 kHz to 999.9995 MHz •Continuous frequency coverage •Transmit protection, up to 100 watts •CTS tone encoder, 1 kHz and external modulation.

RSG-10
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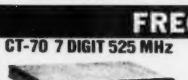
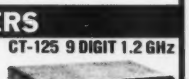
Finally, a low-cost lab quality signal generator—a true alternative to the $7,000 generators. The RSG-10 is a hard working, but easy to use generator ideal for the lab as well as for production test. Lease it for less than $3.00 a day. Features •100 kHz to 999 MHz •100 Hz resolution to 500 MHz, 200 Hz above • – 130 to + 10 dBm output range •0.1 dB output resolution •AM and FM modulation •20 programmable memories •Output selection in volts, dB, dBm with instant conversion between units •RF output reverse power protected •LED display of all parameters—no analog guesswork!

FREQUENCY COUNTERS

CT-70 7 DIGIT 525 MHz **CT-90 9 DIGIT 600 MHz** **CT-125 9 DIGIT 1.2 GHz**





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NEW CT-250 2.5 GHZ

ACCESSORIES FOR COUNTERS

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High impedance probe, light loading, HP-1	$16.95
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Tilt bail, elevates counter for easy viewing, TB-70	$ 9.95
Rechargeable internal battery pack, BP-4	$ 8.95
CT-90 oven timebase, 0.1 ppm accuracy, OV-1	59.95

ALL COUNTERS ARE FULLY WIRED & TESTED

MODEL	FREQ. RANGE	SENSITIVITY	DIGITS	RESOLUTION	PRICE
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CT-70	20 Hz–550 MHz	< 50 mV to 150 MHz	7	1 Hz, 10 Hz, 100 Hz	$139.95
CT-90	10 Hz–600 MHz	< 10 mV to 150 MHz < 150 mV to 600 MHz	9	0.1 Hz, 10 Hz, 100 Hz	$169.95
CT-125	10 Hz–1.25 GHz	< 25mV to 50 MHz < 15 mV to 500 MHz < 100 mV to 1 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$189.95
CT-250	10 Hz–2.5 GHz typically 3.0 GHz	< 25 mV to 50 MHz < 10 mV to 1 GHz < 50 mV to 2.5 GHz	9	0.1 Hz, 1 Hz, 10 Hz	$249.95
PS10B Prescaler	10 MHz–1.5 GHz, divide by 1000	< 50 mV	Convert your existing counter to 1.5 GHz		$89.95

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$89.95 complete kit SG-7

New low-cost microwave Doppler radar kit "clocks" cars, planes, boats, horses, bikes or any large moving object. Operates at 2.6 GHz with up to 1/4 mile range. LED digital readout displays speed in miles per hour, kilometers per hour or feet per second! Earphone output allows for listening to actual doppler shift. Uses two 1-lb coffee cans for antenna (not included) and runs on 12 VDC. Easy to build—all microwave circuitry is PC stripline. ABS plastic case with speedy graphics for a professional look. A very useful and full-of-fun kit.

BROADBAND PREAMP

Boost those weak signals to your scanner, TV, shortwave radio or frequency counter. Flat 25 dB gain, 1 to 1000 MHz. 3 dB NF. BNC connectors. Runs on 12 VDC or 110 VAC.
PR-2, wired, includes AC adapter $59.95

2M POWER AMP

Easy to build power amp has 8 times power gain, 1W in, 8W out, 2W in, 16W out, 5W is for 40W out. Same amp as featured in many ham magazine articles. Complete with all parts, less case and T-R relay.
PA-1, 40W pwr amp kit $34.95
TR-1, RF sensed T-R relay kit $11.95

FM WIRELESS MIKE KITS

FM-3 SHOWN

Pick the unit that's right for you. All units transmit stable signal in 88-108 MHz FM band up to 300' except for hi power FM-4 that goes up to 1/2 mile.
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FM-2, as above but with added mike preamp $7.95
FM-4, long range, high power with very sensitive audio section, picks up voices 10' away $14.95
MC-1, miniature sensitive mike cartridge for FM-1,2,4 ..... $2.95

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A real microwave Doppler sensor that will detect a human as far as 10 feet away. Operates on 1.3 GHz, and is not affected by heat, light, or vibrations. Drives up to 100 mA output, normally open or closed, runs on 12 VDC.
Complete kit MD-3 $19.95

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Neat kit that will produce 25 different classical and popular tunes, plus 3 doorchime sounds. Lots of fun for doorbells, shop, or store entrances, car horn, music boxes, etc. Runs on 9V battery or wall transformer. Excellent speaker volume and adjustable tempo and pitch. Add our case set for a handsome finished look.
Complete kit, MM-5 ..... $24.95
Case + knob set, CMM-5 $12.95

PACKET RADIO

Two new versions are available for the Commodore 64 (P-64A) or the IBM-PC (P-IBM). Easy assembly "NO TUNING". Includes FREE disk software, PC Board and Full Documentation.

KIT	P-64A	$59.95
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CASE	CPK	$12.95

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Make that reciever come ALIVE! Small size for easy installation with Hi-Q tuned input for peak performance. Excellent gain and noise figure—guaranteed to improve reception! Specify band: 2M—PR-10, 220 MHz—PR-20, 440 MHz—PR-40.
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Voice activated switch kit provides switched output with current capability up to 100 mA. Can drive relays, lights, LED, or even a tape recorder motor. Runs on 9 VDC.
VS-1 kit. $6.95

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TS-4 kit $9.95

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Transmits audio over infrared beam up to 30'—use simple lenses to go up to ¼ mile! Hum free, uses 30 kHz carrier. Great for wireless earphones or undetectable "bug."
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A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2W rms output. Runs on 6 to 15 volts, uses 8–45 ohm speaker.
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BROADBAND PREAMP

Very popular sensitive all-purpose preamp, ideal for scanner, TVs, VHF/UHF rigs, counters. Lo noise, 20 dB gain, 100 kHz–1 GHz, 9V–12 VDC operation.
SA-7 kit $14.95

•2 METERS •223 MHz •440 MHz

$149.95

FANTASTIC FM TRANSCEIVERS

SYNTHESIZED—NO CRYSTALS

Ramsey breaks the price barrier on FM rigs! The FX is ideal for shack, portable or mobile. The wide frequency coverage and programmable repeater splits makes the FX the perfect rig for Amateur, CAP or MARS applications. Packeteers really appreciate the dedicated packet port, "TRUE-FM" signal and almost instant T/R switching. High speed packet? . . . No problem. Twelve diode programmed channels, 5W RF output, sensitive dual conversion receiver and proven EASY assembly. Why pay more for a used foreign rig when you can have one AMERICAN MADE (by you) for less. Comes complete less case and speaker mike. Order our matching case and knob set for that pro look.

FX-146 kit (2 Meters)	$149.95
FX-223 kit (1¼ Meters)	$149.95
FX-440 kit (3/4 Meters)	$169.95
CFX matching case set	$ 24.95

2 MTR & 220 BOOSTER AMP

Here's a great booster for any 2 meter or 220 MHz hand-held unit. These power boosters deliver over 30 watts of output, allowing you to hit the repeater's full quieting while the low noise preamp remarkably improves reception. Ramsey Electronics has sold thousands of 2 meter amp kits, but now we offer completely wired and tested 2 meter, as well as 220 MHz, units. Both have all the features of the high-priced boosters at a fraction of the cost.

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Fully wired & tested $89.95
PA-20 220 MHz POWER BOOSTER (8 X power gain)
Fully wired & tested $89.95

QRP TRANSMITTERS

20, 30, 40, 80M CW TRANSMITTERS

Join the fun on QRP! Thousands of these mini-rigs have been sold and tons of DX contacts have been made. Imagine working Eastern Europe with a $30 transmitter—that's ham radio at its best! These CW rigs are ideal mates to the receivers at right. They have two-position variable crystal control (one popular QRP XTAL included), one watt output and built-in antenna switch. Runs on 12VDC. Add our matching case and knob set for a handsome finished look.
Your choice of bands $29.95
(Specify band: QRP-20, 30, 40 or 80)
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HAM RECEIVERS

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Your choice of bands $29.95
(Specify band: HR-20, HR-30, HR-40, HR-80)
Matching case & knob set, CHR $12.95

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Send perfect CW within an hour of receiving this kit! Easy-to-build kit has sidetone oscillator, speed control and keys most any transmitter. Runs for months on a 9V battery. 28-page manual gives ideas on making your own key for extra savings. Add our matching case set for complete station look.
CW-7 kit $24.95
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Cramped for space? Get longwire performance with this desktop antenna. Properly designed unit has dual HF and VHF circuitry and built-in whip antenna, as well as external jack. RF gain control and 9V operation makes unit ideal for SWLs, traveling hams or scanner buffs who need hotter reception. The matching case and knob set gives the unit a hundred dollar look!
AA-7 Kit $24.95
Matching case & knob set, CAA $12.95

SPEECH SCRAMBLER

Communicate in total privacy over phone or radio. Kit features full duplex operation using frequency inversion. Both mike and speaker or line in/out connections. Easy hookup to any radio, and telephone use requires no direct connection! Easy to build 2 IC circuit. Can also be used to descramble many 2-way radio signals. Finish your kit off with the handsome case & knob set.
SS-7 kit $29.95
Matching case & knob set, CSS $12.95

SHORTWAVE RECEIVER

Fantastic receiver that captures the world with just a 12" antenna! Can receive any 2 MHz portion from 4–11 MHz. True superhet has smooth varactor tuning, AGC, RF gain control, plenty of speaker volume and runs on a 9V battery. Fascinating Scout, school or club project provides hours of fun for even the most serious DXer. For the car, consider our shortwave converter. Two switchable bands (in 3–22 MHz range), each 1 MHz wide—tunable on your car radio dial. Add some interest to your drive home!
Shortwave receiver kit, SRI $29.95
Shortwave converter kit, SCI $27.95
Matching case set for SRI, CSR $12.95
Matching case set for SCI,CSC $12.95

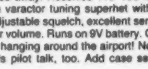
2, 6, 10 MTR, 220 FM RECEIVERS

Keep an ear on the local repeater gang, monitor the cops, check out the weather or just plain listen around. These sensitive superhet receivers are just the ticket. They tune any 5 MHz portion of the band and have smooth varactor tuning, dual conversion with ceramic IF filters, AFC, adjustable squelch and plenty of speaker volume. Runs on 9V battery and performance that rivals the big rigs! For a complete finished pro look, add our matching case and knob set with screened graphics.
FM communications receiver kit $29.95
Specify band: FR 146 (2m), FR6 (6m), FR10 (10m), FR-220 (220 MHz)
Matching case & knob set, CFR $12.95

FM STEREO TRANSMITTER

Run your own stereo FM station! Transmit a stable signal in the standard FM broadcast band throughout the house, dorm or neighborhood. Connects easily to line outputs on CD player, tape decks, etc. Runs on 9V battery, has internal whip antenna and external antenna jack. Add our case set for a "station" look!
FM-10 kit $29.95
Matching case set, CFM $12.95

AIRCRAFT RCVR



Hear exciting aircraft communications—pick up planes up to 100 miles away! Receives 110–136 MHz AM air band, smooth varactor tuning superhet with AGC, ceramic filter, adjustable squelch, excellent sensitivity and lots of speaker volume. Runs on 9V battery. Great for air shows or just hanging around the airport! New 30-page manual details pilot talk, too. Add case set for "pro" look.
AR-1 kit $24.95
Matching case set, CAR $12.95

TERMS: Satisfaction guaranteed. Examine for 10 days. If not pleased return in original form for refund. •Add $3.75 for shipping, handling and insurance. •For foreign orders add 20% for surface mail. •COD (U.S. only): add $5.00. • Orders under $20, add $3.00. •NY residents add 7% sales tax. •90-day parts warranty on kit parts. •1-year parts & labor warranty on wired units.

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CIRCLE 34 ON READER SERVICE CARD

Number 7 on your Feedback card

by David Pelaez AH2AR/8

The Micro-Mag Mobile Antenna

Compact VHF and UHF antennas for the ham on the go!

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West Milton OH 45383
Telephone: (513) 698-4194
Price class:
MM144 (2m): $43
MM450 (440 MHz): $43
MM270 (2m & 440 MHz): TBA

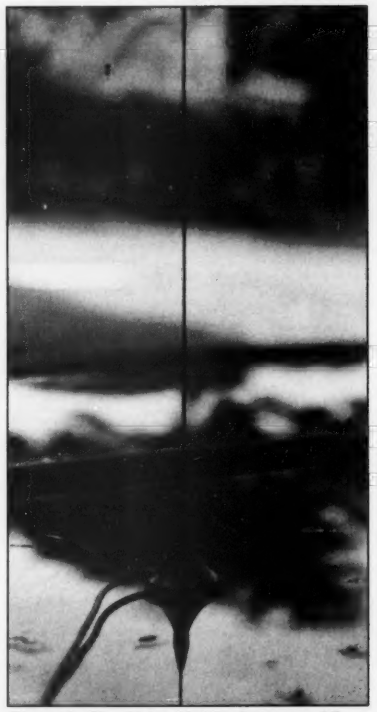

Photo A. The Valor Mobile Antennas Micro-Mag series. Pictured is the 2-meter version (MM-144).

There is one word that describes these new antennas that Valor Enterprises has recently created . . . SLICK!!!

During a recent visit Gerry Stephens W8LLW showed me a prototype mobile ham antenna he had just finished that was going to be added to the Valor Pro-Am line. As Gerry is VP of engineering at Valor, his amateur radio background has helped keep amateur radio products within the company catalogs.

The unusually small size of this mobile antenna makes it quite unique. As I examined it for the first time, I was amazed at the overall size and weight of this magnet-mount antenna. The whole antenna, magnet mount, transmission line and BNC connector tips the scale at under two ounces! How would such a diminutive magnet hold under the buffeting of passing semis and turnpike speeds? Gerry told me, "See for yourself!" Since he knew that I was preparing for the trip down to Florida, what better test scenario would there be?

How Did They Do It??

In an ABS injection-molded base only slightly larger than a Hershey's "Kiss," Valor has added a rare earth magnet. This extremely powerful magnet, made of a Neodymium-Iron-Boron compound, forms the heart of the MM series mobile antennas. Its size, weight and magnetic strength make it a real powerhouse. Valor didn't stop with quality materials at the base. The antenna itself is made from a 17-7 pH stainless steel 0.046" rod that has been black-chromed. A 9-foot run of RG-174 coax is used to compliment the diminutive base, and the line terminates into a strain relief type BNC connector. As this system was designed for taking on and off vehicles as a pack-away antenna, the antenna's power rating is 50 watts (determined by the use of RG-174) for the 2 meter version (and the 2 meter portion of the dual-band antenna), and 35 watts when using the dual-band antenna on 440 MHz.

Road Test

Take care when placing the antenna mount on a painted metallic surface. The magnet is very powerful so there will be a tendency for it to pick up all sorts of stuff. There is nothing quite as abrasive as the fine grit the magnet seems to find when it is off the vehicle. A careful wipe of the base's footprint with a clean towel,

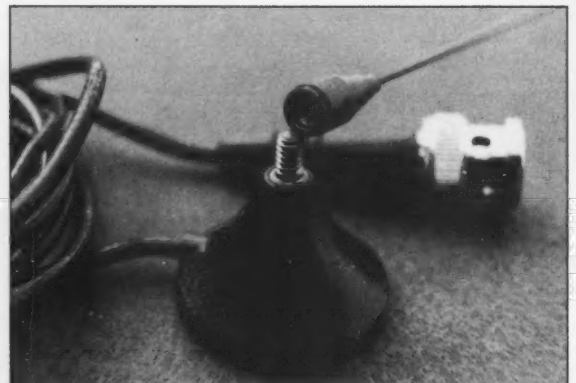

Photo B. The threaded brass connection allows for quick changing of the whip. The BNC connector is shown for size comparison.

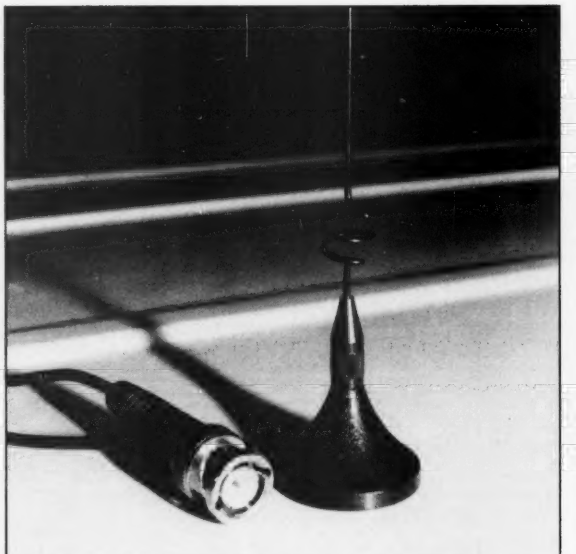

Photo C. The MM-270 dual-band version. The miniature base holds up even at high speeds thanks to a rare earth magnet in the base.

along with a close inspection afterward will insure that you won't drive any iron filings into the paint on the ol' steed. As odd as it sounds, I found that the magnet was so strong that it would attract the very fine copper wires from past coax soldering projects. The tinned copper strands from the braid had enough ferrous tin plating on them to become magnetic. Also remember to tip the base and lift straight up in order to remove it from a surface . . . don't try to slide it off . . . or ssccrraaatttccchhh!!!

After logging over 3,500 miles in 28 days, the quarter-wave MM144 faithfully stayed in place and budged only when I took it off to put it on another vehicle. The convenience of having a quarter-wave miniature 2 meter antenna for instantaneous use on any of the vehicles we were using really spoiled us. Usually, the thought of lugging around coiled-up RG-58 and a large magnet mobile antenna would be enough for us to intentionally forget it. If ever there was such a thing as a perfect idea . . . this was it. No more iron ballast for this chap!

Some More Good Points

As a frequent flier, I also see the advantage of this mobile antenna for briefcase packing. The MM270 becomes the perfect companion to a dual-band handie talkie while using rental cars. Additionally, its extremely low-profile design makes it virtually invisible from 30 feet away.

Both antennas will be available by the time this article is published. The dual-bander will be much like its little brother—it will be a quarter-wave antenna (unity gain) for 2 meters, but it will also perform as a 5/8-wave antenna (3 dB gain) on 440 MHz. Valor has done its homework on trimming these antennas right the first time: As there are no user adjustments on these stainless steel antennas, Valor has insured that they are cut to tolerance so no tuning is required.

The 2 meter version that I field-tested showed a very flat VSWR across the 2 meter band. As a matter of fact, the Smith Chart from the Network analyzer reveals a bandwidth of nearly 23 MHz at less than 2.0 to 1. This antenna covers a good slice of the VHF public service band, with the SWR "trough" centered around 146 MHz. The highest reading at any one given point on the 2 meter amateur band was 1.4 to 1, and it was almost flat near 146 MHz.

The Drum Roll, Please!

I have never seen a magnet-mount mobile as slick as this one. If you are looking for an extremely high quality magnet mount antenna, the size of a flea but with the grip of a gorilla, Valor appears to be the only company producing such a beastie. Gerry says that there are some European cellular phone antennas that have this low a profile, but it looks like Valor is the first to come up with this concept for amateur use in the United States. I am most certain it will become a very popular antenna! Just don't forget to eat your Wheaties before you remove it! 73

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Option For Your ICOM™ R7000

DELTACOMM I-7000 and your MS-DOS computer gives you a custom interface integrated with optimized software that will not just control but will maximize the potential of your R7000.

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DELTACOMM DSS (Digital Signal Strength) upgrade for the DELTACOMM I-7000 communication manager.

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DELTACOMM I-7000 communication manager program includes all cabling, manual, UL listed power supply and Delta Research custom interface for $299.00 + $8.00 (U.S.) or $25.00 (foreign) S&H. The DELTACOMM DSS interface upgrade comes complete with easy to follow NO SOLDER installation instructions, all cabling and 8-bit DSS A/D converter module for $99.00 + $8.00 (U.S.) or $25.00 (foreign) S&H and is available as an upgrade option to registered I-7000 users.

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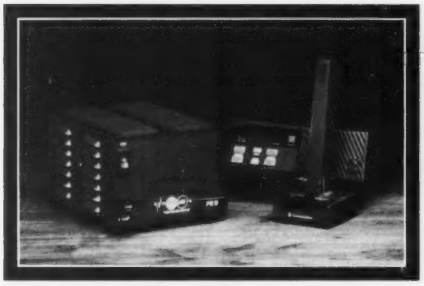

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CIRCLE 255 ON READER SERVICE CARD

Is 2 Meters Hazardous to Your Health?

How to calculate safety.

by Paul Danzer N1II

One day this could be the label on your new handie-talkie. Far-fetched idea? Well, maybe not. According to the latest radiation safety standard expected to be issued by the American National Standards Institute, we could have a problem.

A Few Definitions

The American National Standards Institute (ANSI) is a group devoted to establishing standards for both industry and government. It uses working groups of engineers, technicians, and university professors to determine what should and should not be included in these standards.

Let's begin with the conclusion. According to the ANSI specifications, we are OK. It says that unless the antenna is placed and kept next to your skin, transmitters of 7 watts or less (at 146 MHz—2 meters) are exempt. So technically our handie-talkies and little rubber duckies don't pose any problem.

But just in case—since 7 watts is not inscribed in stone as the eleventh commandment—suppose that one provision did not exist. If we calculate the field strength to which we are exposed, just how bad is it?

The power radiated from a test case of a handie with a rubber duckie depends on a host of not very well controlled things: the efficiency of the rubber duck, the effective ground plane of the body of the handie and the conductivity of our arms, among other factors.

What Do the Specifications Say?

Before starting, we have to look at the specifications and see what they say. When do we know we have a problem? For 2 meters, the 144-148 MHz band, the warning bell rings at an average power density of 1 milliwatt (mW) per square centimeter. This is the same as about 6.5 mW per square inch.

This number is calculated by taking the power out of an antenna and dividing it by the area irradiated by the antenna. If you have 10 watts coming out of an antenna, and somehow all of the power hit an area of one square inch, the average power density would be:

$$\frac{\text{10 watts}}{\text{1 square inch}} = \text{10 watts per square inch}$$

How Strong is the Field of a Rubber Duckie?

Let's take a six-inch-long rubber duckie as our antenna. We know that we are interested in distances close to the antenna—in the "near field"—and we also know the duckie will radiate in all directions pretty equally. No power comes off the ends of the antenna; instead, the power coming out looks like a cylinder, six inches high, centered on the rubber duck. (See Figure 1.)

Armed with the formula for the area of a cylinder—Area = 2 x pi x radius x height (six inches)—we can take the total power of 1 watt and divide it by this area to get the power density at various distances from the duckie.

The curve in Figure 2 does this for us. At three inches we are up at 9 mW per square inch, and we don't get below the 6.5 mW per square inch level until four or five inches away from the duckie.

Are We OK?

I don't know about you but my rubber duckie is a lot closer than four or five inches from my head, so we had better take a little closer look.

The value calculated for three inches and the perfect rubber duckie is 8.84 mW per square inch. A real rubber duckie is not perfect, and we all know that some of them are closer to a dummy load than an antenna. But some are not bad, and a good guess is that instead of being perfect we can claim that the duckie will produce a field strength that is about 2 dB lower than perfect.

A value of 2 dB reduces the field strength by a factor of 1.6, so at three inches we can consider the power density to be reduced to about 5.5 mW/square inch. Since this is lower than the ANSI specification value of 6.5 mW per square inch, we are probably OK.

Three inches is a good guess. Looking at a

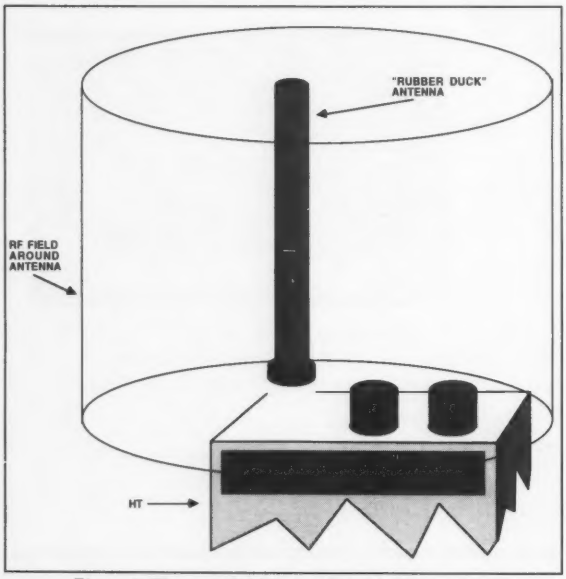

Figure 1. The near field for a rubber duckie antenna.

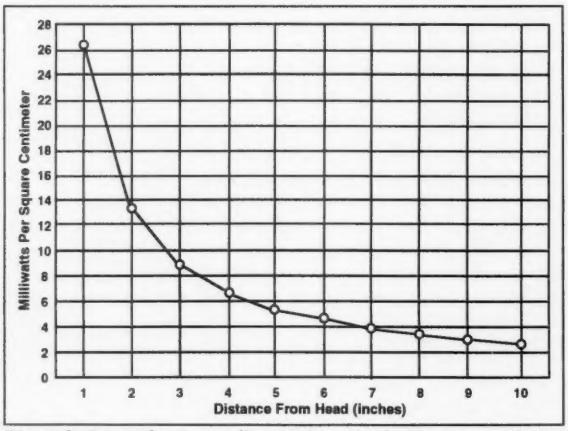

Figure 2. Power density vs. distance from the duckie antenna (1-watt transmitter).

real case (as shown in Figure 3), the handie is usually at an angle and seems to vary from perhaps two inches from the users head at the bottom to five inches away at the top. You can take your own guess and change the numbers accordingly.

Long-Winded Operators

The ANSI specifications have another provision which we should consider. It says that the power is averaged for each six-minute period. In our real case you can take the time that the transmitter is on, divide it by the time it is off (with six minutes maximum for the total on/off period), and use this factor to reduce the average of the field strength. Why a six-minute period? It is probably related to heating effects in meat (your head and my head), but in any case we have a practical solution.

Suppose three of us are on the repeater, with a long time-out setting. If each of us talk for two minutes, the on time is then two minutes out of six, or 33%. Therefore, we can take the 5.5 mW per square inch calculated before, take 33% of it, and come out with a nice safe 1.8 mW per square inch.

Higher Power Handie-Talkies

Up until now we were basing our numbers on a 1-watt handie-talkie. Suppose you are using a 5-watt unit. This would produce 5 x 1.8, or 9.2 mW per square inch—over the limit!

Or suppose we are using one of those new battery packs that provide 12 volts and maximum power—8 watts or more. Now we do have a real problem.

All of this was based on general calculations. Unfortunately, our use of handie-talkies is such that we seem to keep them close to a very vulnerable organ—our eyes—and this is probably one of the worst positions in which to put a radiating source.

Conclusion

After all of this, what can we say? Sorry, but in this increasingly complex world there is no single, simple answer. As you have seen, making a few approximations by using arithmetic comes out with some numbers which strongly suggest that a few precautions are in order:

- Keep the antenna away from you.
- Use the lowest power possible.
- Keep the duty cycle low—talk little, listen a lot, or at least don't be long-winded.

Is the handie safe? So far as we can tell, it can be used within the ANSI limits. As with almost anything in this world that you enjoy, you can take it too far, abuse it, and get into problems. But for now I am going to keep using my rubber duckie on my daily dog walks—and cutting it back to the low power position whenever possible.

Credits and Apologies

The people who put together the ANSI specifications had a very difficult task, and we can only be grateful for their efforts. To get a copy of the specifications ("American National Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI C95.1-1990), contact: The Institute of Electrical and Electronic Engineers, 345 East 47th Street, New York NY 10017. Ask for the latest revision available.

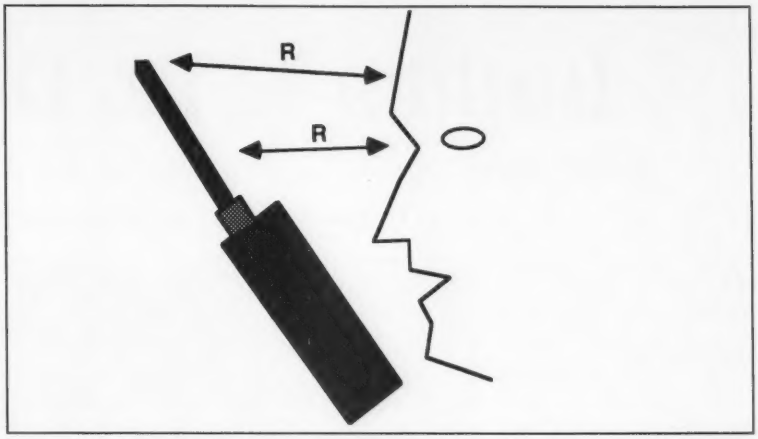

Figure 3. Typical operating positions put the antenna about 2 inches from the head at the base and about 5 inches away at the end.

Footnote for other VHF/UHF/microwave bands: The specifications provide a limit of 1 milliwatt per square cm for the frequency range of 100 to 300 MHz. For 3000 MHz on up the limit is 10 mW per square cm. In between, from 300 MHz to 3000 MHz, the limit is given by the formula f/300 where f is in MHz. Therefore, for operation on 450 MHz the allowable limit would be 450/300 or 1.5 mW per square cm. At 900 MHz, the result is 900/300 = 3 mW per square cm.

The low power or 7-watt exclusion applies to all transmitters operating between 100 kHz and 1.5 GHz. Additionally, there is some loosening of the requirements for partial body exposure. However, these "easier" numbers are not applicable when the part of the body includes the eyes or testes.

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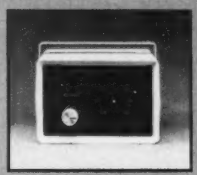

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Build a LiTZ Decoder

Touch-tone control your speaker for emergency alerts.

by Paull Holmes KA5RZI and Marshall Macy N7IOB

Although not universal, LiTZ (Long Tone Zero) appears to be the method being adopted by most as the amateur radio standard for urgent or emergency traffic. A number of amateur radio clubs, as well as the ARRL, have endorsed LiTZ as a standard. In many areas, LiTZ-equipped receivers are monitoring 24 hours a day and held silent by a LiTZ decoder until a request for help is received. When an amateur needs help, he/she simply plays a DTMF (Dual Tone Multi-Frequency) zero for approximately six seconds and the decoders are activated, and speakers are then connected to the monitor receivers.

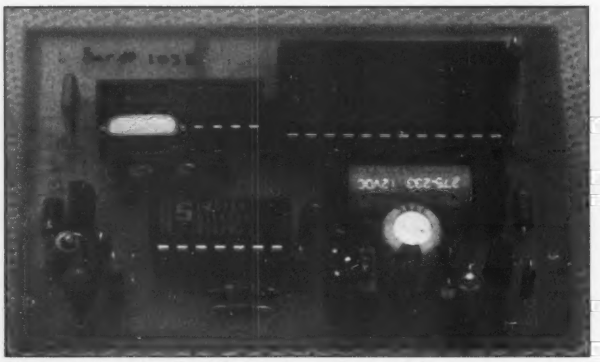

Photo A. Completed LiTZ decoder and one of the prototype circuit boards.

Photo B. The LiTZ (Long Tone Zero) decoder in service using a flea market scanner and mobile speaker.

Overview

There are a number of advantages to the LiTZ signaling method. The technology is reliable, it does not require any modifications to the receivers (or to local repeaters), and it's inexpensive. Almost all amateur 2m transceivers are equipped with a standard DTMF Touch-Tone pad, hence are LiTZ-"ready" to send a request for help.

A search through amateur radio magazines indicates that the LiTZ method is not new—we found several different construction articles dating back 10 or more years. As with most electronics, the construction difficulty of a reliable decoder has been sharply reduced in recent years because of the elegance of the ICs available for specific tasks.

It occurred to us that perhaps one of the reasons that LiTZ has not been adopted on an even wider scale is the lack of an inexpensive source of the decoders. This construction article is an attempt to make LiTZ more available.

Any receiver (transceivers, scanners, etc.) can be used as a LiTZ monitor because this decoder is simply installed in the speaker lead, with absolutely no modifications to the receiver. It uses a crystal-controlled decoder chip and will decode any of the 16 standard DTMF tones including the standard 0 tone. The decoder requires only one non-critical adjustment to adjust the timing interval to about three seconds of tone to activate the speaker circuit.

Theory and Construction

A LM324 quad op-amp is used (see Figure 1). One section (D) amplifies the incoming audio. This amplified signal is fed to an SSI-202 chip which decodes the DTMF to a four-bit binary value that passes to the 4515, which decodes the four bits to one-of-16 that corresponds to each of the 16 possible DTMF tones.

The 4515 is an active low device, so one output will go low when a DTMF tone is decoded. When the selected output goes low, it is connected through D5 to pin 3 of the LM324. The output of this section also goes low and allows capacitor C7 to begin discharging through the resistor network R9 and R10. When the voltage on C7 decays to less than the reference voltage on pin 5, the output of this next section goes to approximately 12 volts and applies a positive voltage to the gate of the SCR (2N5060) which latches it on. The SCR causes the relay which connects the audio to the speaker to close. The SCR also turns on a red LED (a flashing variety) so that there is also a visual indication of the LiTZ alarm.

Other tones may also be connected to E7 through a small signal diode (1N914) to the desired tone pin of the 4515 if more than one tone should be decoded in the LiTZ fashion. This might be useful if a "local" alert signal as well as the standard zero is desired. Note that the tones are NOT decoded in sequence; this arrangement just allows the decoder to "listen" for more than one tone.

To expand a bit on the idea of strapping the decoder for tones other than 0, let's consider the possibility of having your decoder respond to some other digit, say the number 2. This would allow you to latch the decoder by transmitting the digit 2, but this digit 2 tone would not activate other true "LiTZ" decoders in the service area of the repeater. As use of this system grows in a service area, tone assignment coordination will probably be required, but the the addition or changing of the tone is a simple matter and entails no parts expense other than an inexpensive small signal diode needed for each digit to be decoded. Solder points E5, E6, and E7 are provided to accommodate diodes to the output pins of the 4515 IC which corresponds to the digit(s) that you wish to add to your list. It is possible to "strap" as many digits in this manner as you wish.

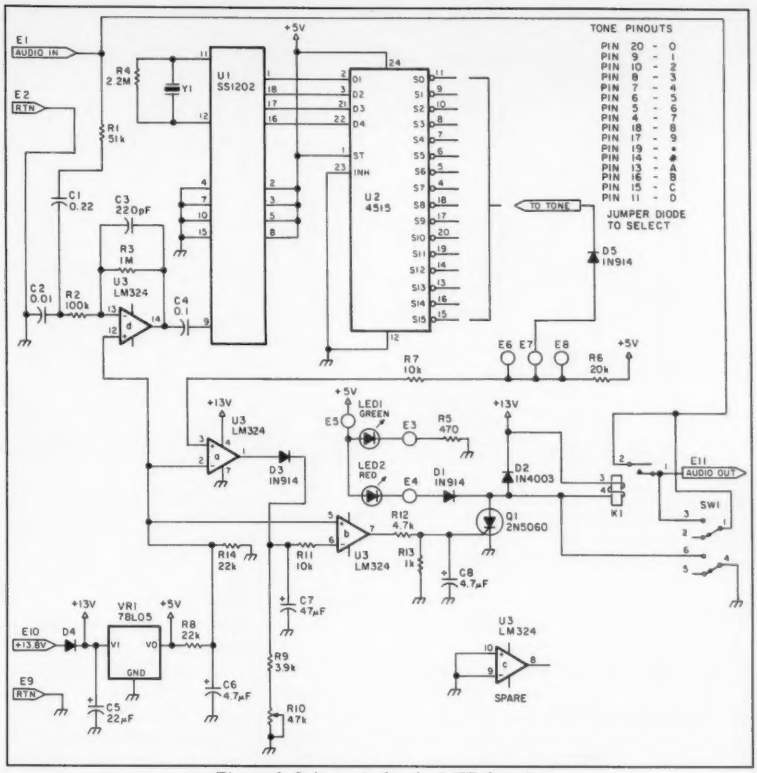

Figure 1. Schematic for the LiTZ decoder.

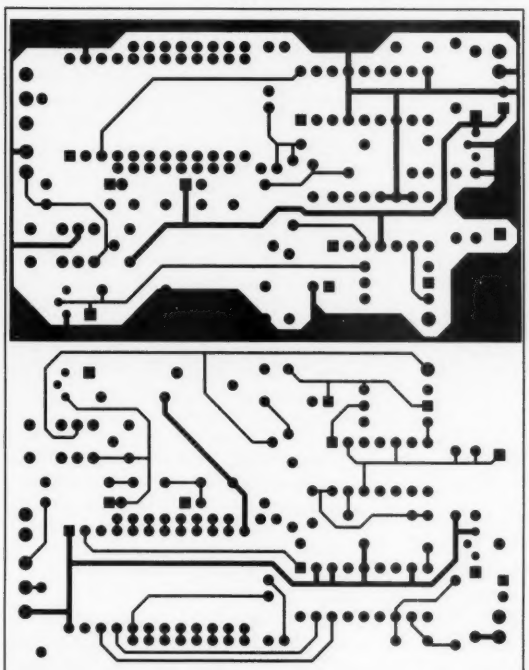

Figure 2 (a). PC board foil pattern for the component side. (b). PC board foil pattern for the solder side.

Construction is straightforward. The project can be wired on a small perf board, or you can make your own PC board, or order one of the several kit options available. A 78L05 three-terminal voltage regulator provides the +5 volts for the SSI-202 and the 4515 chips. This regulated +5 volts is also used to establish the reference for the comparitors (sections A and B of the LM324) used for the timing. A DPDT switch is used to bypass or reset the decoder. An SPST switch would work to reset the decoder, but we wanted to be able to bypass the decoder even if it was not powered.

We built our decoders into small Radio Shack boxes (270-293) (see Photo A). The partition, inside the box for the battery, is scored and removed; the circuit board is held by small pieces of foam weather strip on the sides of the box. The board just fits—simply place the weather strip along the sides of the box and press the board into it. It is *not* possible to use the screws provided to hold the box together—we simply used small strips of electrical tape along the side

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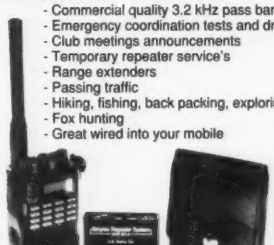

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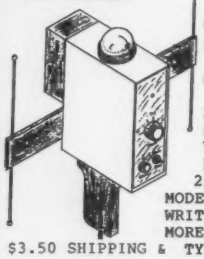

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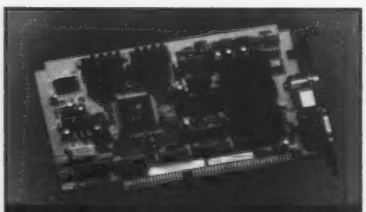

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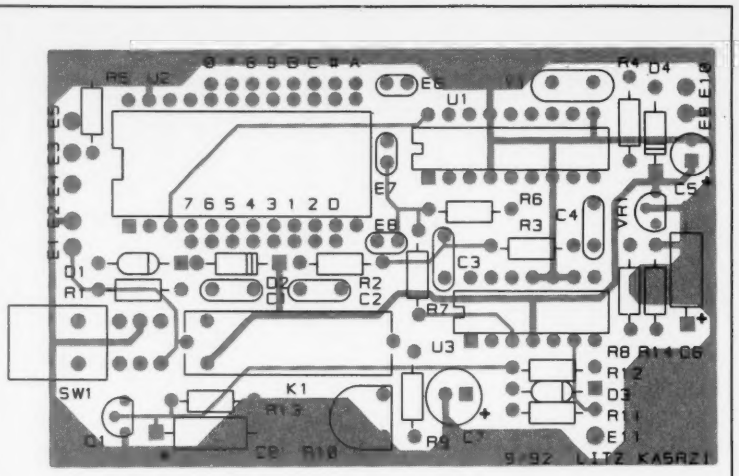

Figure 3. Parts placement diagram. (If you make your own PC boards, you will need to solder leads on both sides where necessary. This won't be necessary if using the board available in the parts list since it has plated-through holes.)

seams of the box. This doesn't sound very elegant, but it seems to work very well and even looks fine. Drilling and fitting the pieces into the box is somewhat tedious and probably takes as much time as the construction of the electronics, but the results produce a fine-looking decoder.

The only adjustment on the decoder is R10, which determines the amount of time that the DTMF tone must be received before the decoder latches. Normally, the timer is set for about three seconds; LiTZ users are advised to "play" the tone for six seconds to make sure the decoders hear it. Pushing the 0 for the longer time also makes the LiTZ receiver sound about three seconds of tone as an audible alert signal after the speaker is connected.

When completed, the decoder requires an external speaker and a low current source of +13 volts. We used an old $15 flea market scanner that I had on hand as the LiTZ receiver (see Photo B).

This old scanner even has a 13-volt accessory output on the back which has worked fine as a power source. Virtually any receiver will work as long as it is capable of receiving a dependable signal from your local repeater. Note: The decoder requires that the speaker of the receiver have one side tied to a common ground. If the speaker floats above ground this decoder will not work. Also, an external speaker output must be available on the receiver.

There is a possible trap: I considered building my first version of the decoder into a mobile speaker box; however, this decoder uses a reed relay which would be affected by the magnet in the speaker. To use this decoder in a speaker box would require protecting the relay from the magnetic field.

My own decoder has been active for several months, has never had a false decode, and has never failed in a test. Even very noisy signals through our local repeater have decoded flawlessly.

Fortunately, I have never received a true "LiTZ" emergency, but I am ready! I hope that many other LiTZ receivers go "online" and listen for . . . hopefully not . . . me!

Parts List

R1	51k
R2	100k
R3	1meg
R4	2.2meg
R5	470Ω
R6	20k
R7,R11	10k
R8,R14	22k
R9	3.6k
R10	47k trimpot
R12	4.7k
R13	1k
C1	0.22 µF 50V
C2	0.01 µF 50V
C3	220 pF 50V
C4	0.1 µF 50V
C5	22 µF elec. 16V
C6,C8	4.7 µF elec. 10V
C7	47 µF elec. 16V
D1,D3,D5	1N914
D2,D4	1N4003
U1	SSI-202
U2	4515
U3	LM324N
Y1	3.5795 MHz color-burst crystal
VR1	78L05
Q1	2N5060 (SCR)
LED1	Green LED
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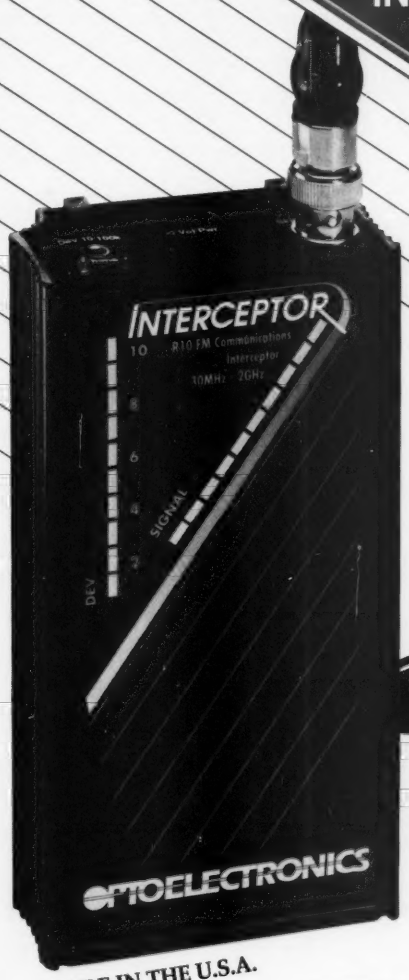

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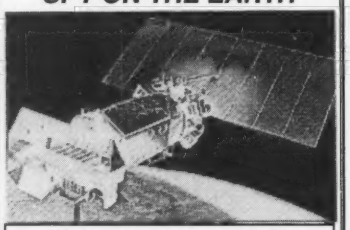

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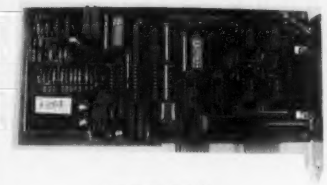

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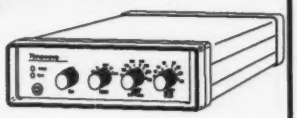

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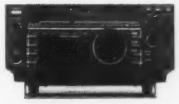

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Iambic Keyer Paddles

A wide array of choices.

by John L. Rehak N6HI

These days, the majority of active CW operators on the bands are using iambic keyers, also called squeeze keyers. A keyer is an electronic circuit that can automatically produce a continuous string of dots while one paddle contact is closed, and a continuous string of dashes when the other paddle is closed. An iambic keyer takes this technique a step further: If *both* paddle contacts are closed simultaneously, the keyer will produce a string of alternating dots and dashes. What this means is that many characters (those that contain alternating dots and dashes, such as R and C) can be formed by a single "squeeze" of the paddle.

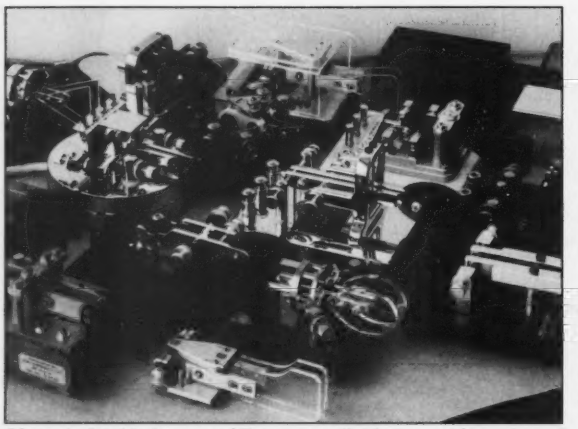

Photo A. Iambic keyer paddles are available in a wide variety of shapes and sizes. Photo by N7YVK.

Any paddle simply consists of two switches which are used to control the keyer. An iambic paddle is one that allows the operator to close both switches either separately or simultaneously, to allow for "iambic" keying.

Why Iambic?

Iambic keying translates into more efficient and less tiring operation for the CW operator because some characters can be formed with less movement. If you are moving up to an iambic keyer from a hand key, bug, or a non-iambic keyer, you may find that the new technique will take a little time to get used to. It is well worth the effort, though, because you will be able to send at higher speeds and with less effort.

Most keyers available commercially today are iambic. To be able to use the iambic mode of these keyers you must have an iambic paddle, or "squeeze paddle." Most paddles available today are iambics, but you will still find non-iambic or "single lever" paddles available from Bencher, Vibroplex, and others. I highly recommend that you invest in a good keyer and iambic paddle. It will certainly enhance your enjoyment and proficiency at working CW . . . and iambic keying is fun!

What to Look For in a Paddle

There are many iambic paddles available today, some better than others, and I highly recommend that you try several if possible before making a purchase. Here are a few general suggestions of what to look for in a good iambic paddle:

Feel This almost goes without saying, but if you try various paddles, you will certainly find that the "feel" of the paddles varies tremendously. Some have a light touch, some are stiffer or more sluggish in response, and some even have a "clunky" or sloppy feel. A good paddle should feel very smooth and precise, and not ever make you feel like you are "fighting" it.

Weight When it comes to the weight of a paddle, the heavier the better! If a paddle does not have a base that is heavy enough, it will tend to slide or "walk" around on the tabletop as you use it. Many CW operators have been known to use double-sided tape or rubber cement in an attempt to tame a walking paddle! Get a heavy one, especially if you are a "heavy hitter," and you won't have to resort to tape or glue to keep your paddle in place in the heat of a pile-up or contest when the going gets fast and frantic!

Adjustability Ideally, contact spacing and tension ("return force") should both be independently adjustable for each side. As a minimum, contact spacing should be separately adjustable for both dot and dash contacts, and tension should at least be adjustable for both sides together—separate is better! A few paddles also allow adjustment of the spacing between the finger pieces, which will allow you to custom tailor the spacing between thumb and finger levers to your preference.

Almost all paddles allow you to adjust contact spacing and tension, but the range of adjustment varies tremendously. The ideal paddle will allow contact spacing to be easily adjusted from "way too close" to "way too wide," and tension to be adjusted from "way too light" to "way too heavy"!

Another factor to consider is the means by which the adjustments are made. Some paddles require tools to adjust and some do not. The advantage of having a paddle that adjusts without the need for tools, such as by using thumbscrews, is that you can make adjustments any time or any place. There may also be an advantage to having a paddle that does require tools to adjust: The adjustments would then be considered somewhat more permanent, and if you would prefer that others not disturb your favorite settings they are a lot less likely to do so if the adjustment requires an Allen wrench which is in *your* pocket!

It is important that a paddle not only be adjustable, but that the exact settings you make will hold their positions well over a long period of time. Some paddles will tend to drift away from your favorite settings, which can be annoying.

Contact spacing on some paddles can be adjusted so close that even the slightest touch will activate the contacts. With others, you may find that if you attempt to set the contact spacing too close, the paddle will exhibit "bounce back": When you hit one side fairly hard, the contact will close, but then the other side will bounce back and close its contacts, which will cause you to make sending errors.

Connections Different paddles require different means to attach the cable that connects the paddle to your keyer. Some require that you solder the cable to the underside of the paddle. This method has its pros and cons. The plus side is that the paddle cable is permanently attached so it won't get separated from the paddle and lost. On the minus side, if the cable develops a problem you will need to have a soldering iron available to repair it.

Other models have binding posts or thumbscrews which allow you to connect cables without soldering. At least one model has all the connections completely enclosed inside the paddle's base. This makes for a neat appearance and eliminates the possibility of shorting the connections if the paddle is

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set down on an irregular-shaped conductive surface. It will also prevent you from becoming part of the circuit if you are operating mobile with the paddle on your lap!

One manufacturer in England provides a jack mounted directly on the paddle base to simply plug in a cable to connect to the transmitter. I think that this is the best approach as it will allow you to easily change cables at any time. If you want to switch to a different length cable or if the cable develops a problem you can simply plug in a new one.

Appearance An iambic paddle is among the more expensive accessory items that you will purchase for your ham shack, and because it is going to be prominently located in your station it will be noticed by visitors. If you have a real "showroom" ham station, you may want a real eye-catcher for a paddle. I collect keys, bugs, and paddles, and I have a couple of older paddles, long since out of production, that can only be referred to as "ugly," but they are fun conversation pieces! Most of the paddles on the market today look pretty sharp, and a few are real works of art.

A Review of Some Specific Models

In this section we will look at currently available iambic paddles. They are listed in alphabetical order, and I have included some personal observations and comments regarding each model. See the sidebar on p. 46 for company addresses.

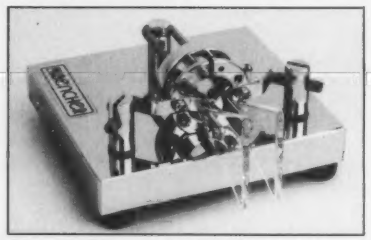

Photo B. The popular Bencher iambic paddle offers high quality with an excellent feel. Photo courtesy of Bencher, Inc.

Bencher Iambic Paddle—Black: $72.95; Chrome: $89.95 (Photo B); Gold: $250. The wide popularity of the Bencher paddle is easy to understand: It is a high quality paddle with an excellent feel at a fair price. Also, it is available at almost all amateur radio dealers. There are three Bencher iambic paddles. The low-cost model has a black base, with the top-mounted parts chromed. The black and chrome is a sharp looking combination. For $17 more you can get the Bencher with both the base and top parts finished in polished chrome. For the ultimate Bencher, there is a gold-plated model available at a premium price. The entire paddle is gold-plated, even the spring! It's beautiful.

All models of the Bencher iambic paddles are identical except for the finish. The Bencher is built on a large, thick, heavy base that helps the paddle stay put on the tabletop. The large contacts are gold-plated, which means they won't need frequent cleaning to maintain good conductivity. The Bencher paddles have a good crisp feel, with just a little "flex," owing mostly to the slightly flexible, triangular-shaped clear plastic finger pieces.

Cable connections to the Bencher are made by soldering to lugs on the bottom of the base. A strain relief is provided to keep the connections from breaking off if the cable is pulled.

There are no thumbscrews or knurled locknuts on the Bencher; you must use tools. The spring tension can be adjusted over a rather narrow range by using a small flat-blade screwdriver, and the contact spacing can be adjusted using a small Allen wrench, provided with the Bencher.

There is also a special version of the Bencher iambic paddle sold by MFJ Enterprises that consists of a standard (black) Bencher iambic paddle with a Curtis Keyer Chip keyer built onto the top of the paddle. This makes for a convenient all-in-one keyer and paddle assembly that can be handy for portable operations because of its small size. Although the keyer circuit is simple and does not include message memories or programmable feature, it does include adjustable weight and tone and offers front-panel speed and volume controls.

The Bencher is a good paddle with an exceptionally good feel and a heavy base.

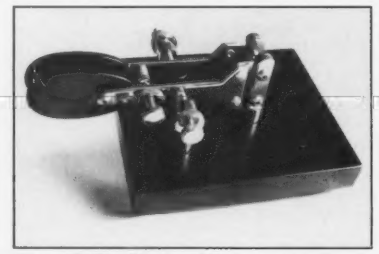

Photo C. The Ditek paddle is nearly silent in operation. Photo courtesy of Ditek Industries.

Ditek Industries Iambic Paddle—$100 (Photo C). The Ditek is a newcomer to the market, and it is a very nice paddle. The construction and appearance are similar to the old Brown Brothers paddle (no longer in production) but the base is considerably larger, thicker, and heavier. The weight, at approximately three pounds, is one of the heaviest on the market. The base is large—very thick and very heavy. The base and finger pieces are black, with the other parts polished stainless steel or chromed. The feel is excellent, very snappy and precise, with no bounce—and it stays put!

This paddle is very quiet in operation. One reason for that is the fact that the chrome thumbscrews that adjust contact spacing include a small nylon tip that almost completely eliminates any sound when a paddle is released. When it returns to the neutral position, rather than metal against metal it is metal against nylon. The support piece that holds the stationary silver-plated contacts is also made of nylon, which helps to quiet the sound when the contacts are closed. The result is that this paddle is nearly silent in operation.

The Ditek's appearance is really sharp, with clean lines and parts that are held together with stainless steel cap screws, giving the paddle a nice finished look yet allowing for complete disassembly if desired. All contact spacing and tension adjustments can be made without tools by adjusting the extra large knurled thumbscrews and locknuts. Cable connections are made to a terminal strip on the bottom with a flat blade screwdriver. A strain relief is provided.

The base surface is a powder coat, which is a process that provides a durable, long-lasting finish with an excellent appearance. Each Ditek paddle has its own distinctive serial number engraved, which is often viewed as a plus by us key collectors. Ditek also plans to offer a version of their paddle with a built-in iambic keyer mounted on the top of the paddle base. The keyer will feature a message memory that can be used for sending CQ or contest exchanges. If you always wished that you had bought a Brown Brothers paddle back when they were still being made, then Ditek is the one for you! I recommend it highly.

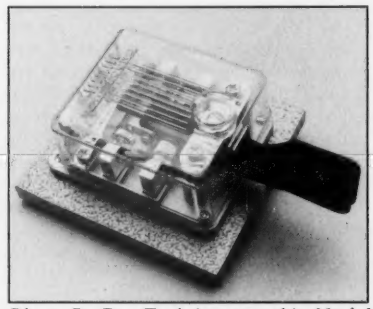

Photo D. EasyTech imports this Model MK706 from Japan. Photo courtesy of EasyTech.

EasyTech Model MK706 Iambic—$64.50 (Photo D). This paddle is manufactured by the Hi-Mound company in Japan, and imported by EasyTech in the U.S.A.

The MK706 weighs only 1.9 lbs., but in spite of its low weight it seems to hold its place on the tabletop quite well. The paddle is also available without a base. If you have the means to make your own base, you could save about $17 by getting the Model MK704 and adding a base of your own crafting.

The paddle comes with a clear plastic cover that snaps over the entire key, leaving only the paddle finger pieces and the three binding posts for the connections accessible. This keeps the paddle clean, and may discourage other operators from tampering with your favorite adjustments!

The finger pieces are large and smooth, but are very close together (less than 3/8" between your finger and thumb when the

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contacts are closed). They are made out of thin plastic that has a *lot* of flex to it, which gives this paddle a "soft" feel, which some operators may prefer.

Contact spacing and tension adjustments for each side are made by knurled nuts which are difficult to adjust, although they probably hold their settings well. Contact tension is on the high side, even at its lighest setting.

EasyTech also sells another model (MK831) which is a high-end model including both an iambic paddle and a straight key mounted on a common base. This model was not available for review, but it looks interesting.

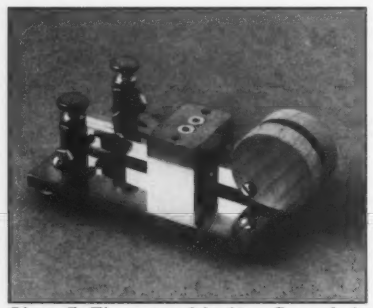

Photo E. The unusual looking Green Lake paddle from Electron Processing. Photo by N7YVX.

Electron Processing Green Lake Paddle—Wood: $89.95 (Photo E); Aluminum: $99.95. The "Green Lake" paddle is probably the most unusual looking paddle you will see. The base and top parts are both made from polished brass. The paddle is available with a choice of aluminum or wood finger pieces. Contact spacing is adjustable, but tension is not. In the model that I tried the tension was about right for my tastes, so I don't consider it a serious drawback that the tension is not adjustable.

The contacts on this paddle are simply pointed screws that make contact with the brass arms of the paddles—not true "contacts" in the normal sense, but probably perfectly adequate for use with the low keying voltage and current of today's modern keyers. This paddle has a nice feel, but it has a rather small base that is only about 5/32" thick so it will tend to slide around on the operating desk. This paddle has the most unique appearance of all I have seen, and would be a nice addition to a collection.

G4ZPY Paddle Keys International Model VHS—$135 (Photo F). G4ZPY makes several models of handmade iambic paddles. The VHS ("Very High Speed") is their top-of-the-line iambic paddle. It is an excellent paddle. The paddle is similar to the Bencher in appearance. The standard model has polished brass top parts mounted on a glossy black base. The contacts are silver, and the finger pieces are the best I have seen on any paddle. They are made from polished plastic, thicker than any I have seen on any other

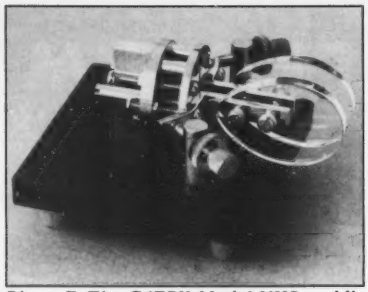

Photo F. The G4ZPY Model VHS paddle from England. Photo by N7YVX.

paddle, and are sculptured to provide a tapered shape that feels great. This paddle has almost no flex at all, owing to the thick brass arms and the extra-thick finger pieces that have no "give," resulting in a very positive "stop" upon contact closures.

Both contact spacing and tension on the VHS are adjustable without tools. The paddle adjustments are among the best I have seen, due to the fact that the adjusting thumbscrews use extra-fine threads which allow adjustments to be easily made in very small increments. The contact adjustment thumbscrews also include a small rubber washer which makes the process of making small adjustments and locking them into place smooth and easy.

The G4ZPY paddles include another nice feature that I have not seen anywhere else: The connections to this paddle are made via a small jack that is mounted directly on the paddle base. This allows you to easily plug in cables of various lengths. I wish others would do this!

The G4ZPY VHS paddle has only one drawback: The base is a bit small and light, although it seems to hold its place on the tabletop fairly well.

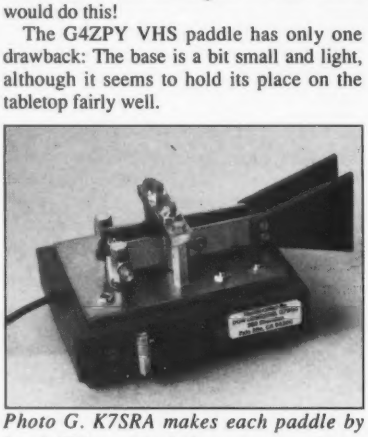

Photo G. K7SRA makes each paddle by hand. This one includes a memory keyer. Photo by N7YVX.

K7SRA Iambic Paddles—$50 to $195 (Photo G). Don Leibrand K7SRA is retired and spends some of his time making iambic paddles on a custom order basis. His paddles are machined from brass and mounted on a wood base. He has produced several different-looking paddles, some with electronic keyers built right into the base. These days he is building some with the sophisticated CMOS Super Keyer II built into it. This keyer has four message memories and a lot of clever programmable features. K7SRA's paddles have a home-built look. He personally builds and tests each one in his home shop.

Contacts, like the rest of the key, are made from brass and require tools to adjust for spacing and tension, both of which can be adjusted over a good range. The paddle "arms" are made of rather thin brass, which gives the paddle a "flexy" feel.

Over the years there have been several different all-in-one keyer/paddle combinations produced by Ten-Tec, Vibroplex and others, but I have not seen any that have incorporated built-in keyers with all the features of the CMOS Super Keyer II that K7SRA is using in his. The keyer has programmable speed, weight, messages, tone, pauses, and more, and offers automatic serial number generation for contest exchanges.

Because K7SRA custom makes each paddle and paddle/keyer combination, he can handle special requests if you want something that is a little different.

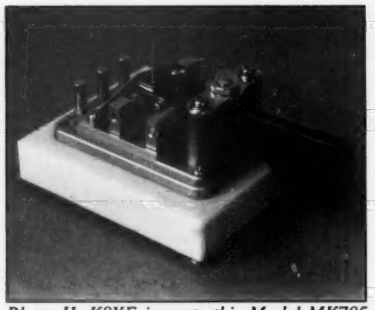

Photo H. K8XF imports this Model MK705 from Japan. Photo by N7YVX.

K8XF Telegrapn Key Import Company MK-705—$129.95 (Photo H). This iambic paddle is also imported from Hi-Mound in Japan. It appears to be identical to the EasyTech paddle, with the exception that this version is mounted on a marble base. The base looks nice, and the additional weight of the marble helps keep the paddle from sliding around on the tabletop. Like the EasyTech, the K8XF paddle has high tension and knurled contact and tension nuts that are difficult to adjust, but should hold their settings well. It has a "soft, flexy" feel which some operators may prefer.

Mercury Paddle by N2DAN—$389.95 (Photo I). Each Mercury paddle is handmade to order by master craftsman and machinist Steve Nurkiewicz N2DAN. To the best of my knowledge, he does not ever advertise his paddles anywhere, although he will gladly send you a brochure describing the Mercury if you send a request.

I might as well start right off by saying that of all the paddles that I've seen, the Mercury is the clear winner, hands down. The Mercury paddle is built from solid brass. It's first nickel-plated, then chrome-plated, with a resulting finish that must be seen to be appreciated! This paddle has the

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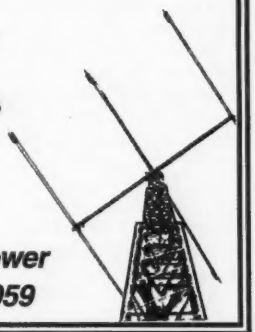

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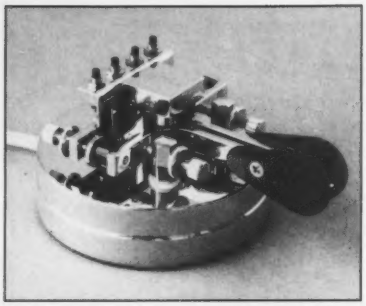

Photo I. The Mercury paddle by N2DAN with optional memory switches. Photo by N7YVX.

best plating that I have ever seen on anything that is chrome-plated! The paddle's appearance is second to none.

It is also without question the best performing paddle of all that I have tried. With this paddle it is possible to set the contacts so close that you can almost cause the contacts to close by just thinking about it! And even with the contacts set extremely close, the paddle exhibits absolutely *no* bounceback. The contacts on the Mercury are exceptionally large, massive contacts that line up and fit together perfectly. They are solid silver, and rhodium plated.

The paddle uses rotary bearings that have absolutely no play or "slop," thus allowing absolutely no vertical movement of the paddle arms. The arms themselves are solid, massive metal in a modified L-shape, with extra-thick plastic finger pieces.

The Mercury paddle uses magnets to provide the tension for the return force. There are no springs to get stretched, lost, or slowly change your adjustments. Once set, the adjustments hold well, yet all adjustments for contact spacing and tension are easily changed without tools, using thumbscrews and knurled locknuts with extra-fine threads to allow for adjustments in extremely fine increments.

The Mercury has a massive solid brass base weighing nearly four pounds! The bottom of this heavily polished chrome-plated base is covered with a thin piece of cork. Between the sheer weight and the anti-slip cork, this paddle definitely will *not* slide around on the tabletop.

Cable connections for the Mercury must be soldered to lugs on the underside of the base. No strain relief is provided, although the size of the hole for the cable to enter the base is such that strain relief can be provided by simply tying a knot in the cable inside the base.

Because each Mercury paddle is custom built to order, Steve N2DAN will do just about anything feasible to customize your paddle to your liking. Options include engraving your callsign and allowing you to choose the color of your finger pieces from over 100 available colors, including several metallics, translucent/flex, and solids. He even offers four different shades of pink for the ladies!

A nice plus for the Mercury paddle is the availability of a custom chrome-plated remote memory bracket that mounts directly onto the Mercury. This provides four small push-buttons to control the message memories for keyers that provide memories, such as the Kansas City Keyer, the CMOS Super-Keyer II, the Accu-Memory, and others. It really is a nice convenience to be able to hit a button on the paddle to call CQ, change keyer speed, send a contest exchange, etc.

At nearly $400, the cost of the hand-made Mercury paddle is probably the highest of any paddle available today. Is it worth it? Well, that depends . . . if, like most of us, your paddle budget is limited, the Mercury may well be beyond reach. On the other hand, if you must own the very best, or if you are in a mood to splurge, I doubt if you will ever regret the purchase. The Mercury has a feel and quality unmatched anywhere, and should last a lifetime. That's a lot of CW contacts!

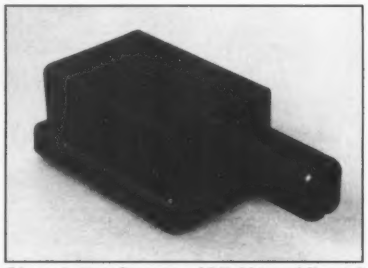

Photo J. Nye Company SSK-001 paddle with top cover in place. Photo by N7YVX.

Nye Company SSK-001 Master Squeeze Key—$51 (Photo J). The William Nye Company Model SSK-001 iambic paddle is the lowest priced of all the iambic paddles currently available on the market. Its construction is quite different from others, and so is the feel. This paddle has a U-shaped cover assembly that acts as a dust cover, and will probably help to keep others from tampering with your adjustments.

The base is die-cast, with a black wrinkle finish, and is heavy enough to hold its position on the tabletop. The top parts include two small metal angle brackets that support the contacts, which are gold-plated solid silver, and resemble the contacts that you would see on an open frame relay.

The contact tension is set by adjusting the compression of a single screw that is backed by two nuts, one to lock the other in place. Contact spacing is set by actually moving the entire metal angle bracket—one for each side—by loosening the bracket with a Phillips screwdriver, sliding the whole bracket over, then tightening the bracket down again. This procedure is imprecise, and the bracket will usually move during the tightening process, requiring you to start all over!

The cable connections require soldering to three internal solder lugs. A strain relief is provided. The finger pieces on the Nye paddle are very long—almost three inches from the pivot point to the fingertip ends, and are made from thin, hollow plastic with a lot of "give," resulting in a very "soft" feel.

Photo K. The Palomar Engineers Jones Key iambic paddle is made in England. Photo courtesy of Palomar Engineers.

Palomar Engineers Iambic Paddle—$135 (Photo K). Palomar Engineers has just introduced a new iambic paddle, the Jones Key, imported from England. This model is new, and at the time of this writing, in short supply, but is expected to be available in quantity by the time this article appears. I have not had the opportunity to try the Jones Key myself, so I cannot comment on its feel, but I have obtained some information about its construction that may help you to get an idea of what it is like.

The base is bright red, with polished brass top parts. The paddle uses four rotary ball bearings embedded inside the brass block, which will prevent possible damage from coffee spills, etc. The paddle is reputed to have a solid "non-flexible" feel. The rear of the plastic finger pieces are rounded and, after you loosen their mounting screws, they can be rotated up or down to suit individual height preference.

The brass post between the two paddle arms at the rear of the key is oval and can be rotated to change the spacing between the paddle's finger pieces. Contact spacing and tension are each individually adjustable for dot and dash sides, using thumbscrews and locknuts that allow these adjustments to be made without tools. Each Jones Key has a unique serial number engraved in the brass block.

R. A. Kent Iambic Paddle—Kit: $70; Assembled: $85 (Photo L). This paddle is manufactured in England but is available directly from the manufacturer's sales office in the U.S.A. The Kent paddle is available as a kit or assembled. The paddle is made from machined brass and has a black painted base with brushed brass top parts. It is similar to a Bencher except that the Kent paddle uses rotary ball bearings, giving the paddle a good solid feel. The paddle pieces do not move up and down at all as they are restricted by the rotary bearings.

Spring tension and contact spacing are adjustable by thumbscrews. These are located such that they are easy to reach and adjust.

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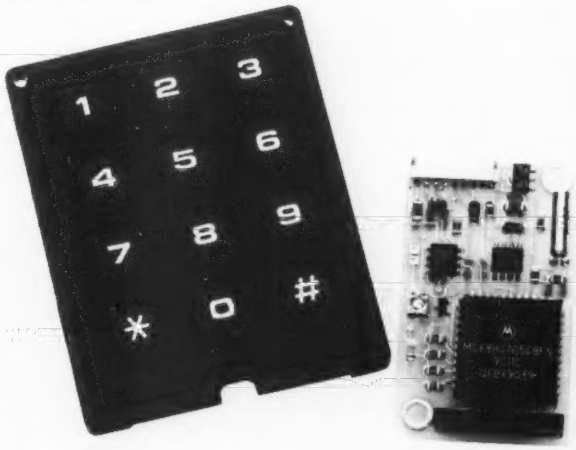

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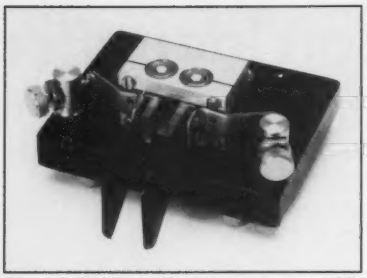

Photo L. The R. A. Kent iambic keyer paddle comes in kit form or assembled. Photo courtesy of R. A. Kent.

The adjustment range is wide, allowing plenty of room for personal preference. The paddle pieces are made from plastic that is a bit thin and has a lot of flex to it, resulting in a rather soft feel.

Connections to this paddle are made via solder lugs on the bottom of the base, with a small cable clamp provided for strain relief. The weight is a little low at 2.6 pounds, so this paddle may tend to slide on the table a bit if you are a "heavy hitter."

The paddle is ruggedly constructed and might be a good choice for a mobile paddle. It's a good choice if you have a light touch.

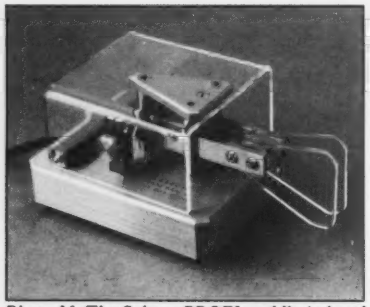

Photo M. The Schurr PROFI paddle is hand made in Germany. Photo by N7YVX.

Schurr PROFI Paddle—$180 (Photo M). Schurr Keys are handmade in Germany and are available only direct from DL7NS in Germany. It is my understanding that they are very popular in Europe. The PROFI is their top-of-the-line iambic paddle. The craftsmanship and feel of this paddle is absolutely first class.

The entire paddle is solid brass, with a unique diamond ground finish protected from corrosion by a process that the Germans call "Zaponierung." The base is heavy, with a weight second only to the N2DAN Mercury paddle. Even the bottom of the base is beautifully finished, with the same diamond ground "brushed" appearance as the rest of the paddle. This base rests on three rubber feet—the best rubber feet I have ever seen on a paddle—their bottom surface is slightly concave which provides a slight "suction cup" effect which, with the extra heavy weight of the base, insures that this paddle definitely will not slip or slide around during use.

The thick brass paddle arms are mounted on precision polished hardened steel pivots, permanently lubricated with molybdenum disulfide. The polished clear plastic finger pieces are rounded triangles. This paddle comes with a replaceable cable already attached so that the user need only supply the appropriate plug to interface with his keyer. Cable connections are soldered, and a strain relief is provided. The PROFI includes a clear plastic dust cover that snaps into place on the paddle and can be tilted up to allow access to the paddle adjustments.

Contact spacing and spring tension settings are adjusted with extra large knurled thumbscrews, using fine threads that allow for very precise adjustments in small increments. The contacts are solid silver.

This paddle is expensive, but the craftsmanship and quality are exceptional. It carries a three-year warranty, but with proper care it should last a lifetime.

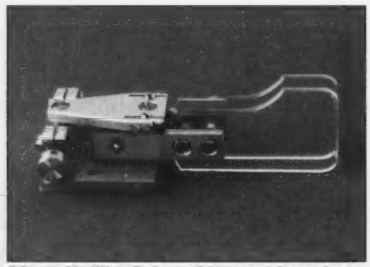

Photo N. The Schurr Mini, with no base, may be mounted in your own keyer. Photo by N7YVX.

Schurr Mini Paddle—$95 (Photo N). This is a miniature version of the Schurr PROFI paddle, and is sold without a base. You can mount the paddle on a wood, plastic, or metal base of your choice, or you may wish to build this little gem into a keyer. All that is required to mount the paddle is to drill two holes. The mounting base of the paddle is tapped for two mounting screws, which are provided. The finger pieces are large, polished clear plastic in an unusual inverted L shape.

This paddle is very small, almost what one might think of as a "spy" paddle! The paddle is made of the same beautiful diamond polished brass as the PROFI, and has an almost identical feel. Connections are made via three solder lugs, although if you mount this paddle on a base you may choose to include alternative cable connectors or a jack. Despite its small size, the Mini has a quality feel equal to that of the larger PROFI model.

Vibroplex Brass Racer Paddle—$65 (Photo O). There are actually two Brass Racers—the regular Brass Racer, and the Brass Racer EK-1, which is the same paddle with a Curtis 8044 Keyer Chip keyer built into the base.

The Brass Racer is solid brass on a hard wood base. One unique feature of this paddle is that the connections are *inside* the paddle base so that once your cable connections

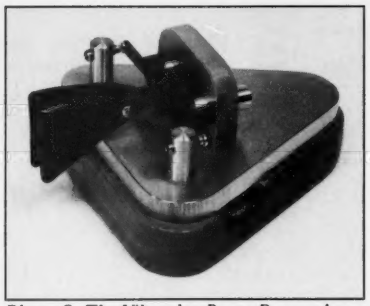

Photo O. The Vibroplex Brass Racer, shown with optional built-in Curtis keyer. Photo courtesy of Vibroplex Co.

are soldered to the paddle and the paddle is screwed down on its base, there are *no* exposed connections on the bottom of the paddle. This makes it a good choice for a mobile operator because you can lay the paddle on your lap or even on a metal surface without worrying about the electrical connections shorting out.

The tension or "return force" for the Brass Racer is provided not by springs, like most paddles, but by magnets. The magnets slide back and forth to provide more or less tension. I consider this to be a big plus because there are no fragile or delicate spring mechanisms, and because this feature allows the paddle to be easily set for a precise amount of tension, varying from "way too light" to "way too heavy."

My only surprise with the Brass Racer is the physical appearance of the paddle. The large triangular brass baseplate and top-mounted brass parts are only "brushed brass," not the highly polished or chrome-plated brass I would have expected from Vibroplex. Although its appearance is not that of the gleaming, jewel-like finish of the Vibroplex Iambic model (or several of their bugs), it is functionally one of the best.

Overall, construction is similar to the Bencher paddles, with solid-silver contacts mounted at the sides, and black plastic finger pieces. The finger piece spacing is adjustable on this model, as is contact spacing and tension, all over a very wide range, making it easy to customize the paddle to your personal preferences for spacing and sensitivity.

Because of the rugged construction and "sealed inside" contacts, the Brass Racer is my favorite for mobile CW operation. I think that functionally this is one of the best low-priced paddles on the market. It has a feel much like the Bencher but has the additional advantages of magnetic tensioning, sealed off cable connections, and rugged construction.

Vibroplex Iambic—Standard: $95; Deluxe: $115 (Photo P); Presentation: $160. The Vibroplex Iambic carries on the traditional look of the Vibroplex bugs in an iambic paddle that is available in three versions, identical in all respects except for the finish of the base: The "Standard" has a textured gray base; the "Deluxe" has a highly

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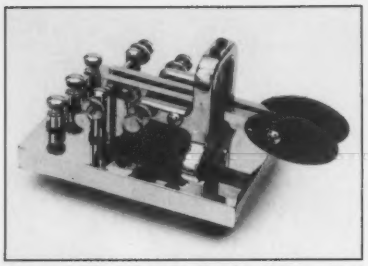

Photo P. The Vibroplex Iambic Deluxe. Note the resemblance to their bugs. Photo courtesy of Vibroplex Co.

polished chrome base; and the "Presentation" has a 24K gold-plated brass plate mounted atop the same polished chrome base as the Deluxe. All three models have highly polished chrome-plated top parts.

If you are familiar with the "bugs" (semi-automatic keys) that Vibroplex has been building for many years, you will notice how similar this paddle appears to their bugs. The base is large, thick, and heavy so this one definitely won't "walk" around on your tabletop!

The contacts are heavy gold-plated. The contact spacing and tension are both adjustable with thumbscrews and knurled locknuts, and the adjustment range is excellent for both spacing and tension, which is provided by compressed springs.

The finger pieces are the familiar polished plastic, oval-shaped finger pieces that Vibroplex has used for years as the "thumb" piece on their famous bugs. The plastic is thick and solid, contributing to the solid feel of this paddle. Contacts may be set very close and still exhibit no "bounce-back."

Connections are made via three thumbscrews located at the back edge of the base. All connections and all adjustments on this paddle can be made without any tools.

The overall appearance of the Deluxe and Presentation models of the Vibroplex Iambic is hard to beat . . . the quality of the workmanship and the heavy chrome plating give those models a trophy-like look that any CW operator would display with pride in his ham shack!

The Vibroplex Iambic may be the ideal choice for you ex-bug operators who have switched to an iambic keyer—it has a feel similar to a bug but is more precise. This paddle is beautifully built and has the classic Vibroplex look.

WB4FJJ Model 3-R Paddle—$80 (Photo Q). Mike March WB4FJJ offers a handmade iambic paddle that is similar to the Bencher but has a new twist that I have not seen elsewhere: The paddle uses magnets rather than springs to provide return force, but in a configuration that returns the paddles to the open contact position by utilizing magnetic repulsion. All other magnetic return paddles that I have seen use magnetic attraction, "pulling" the paddle back to the neutral or open position. This paddle uses two pairs of magnets, arranged such that

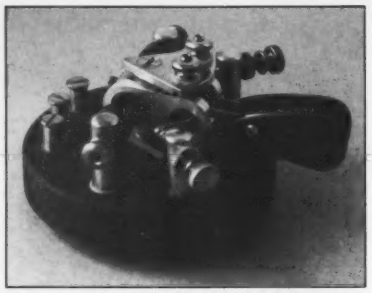

Photo Q. The WB4FJJ Model 3-R iambic paddle uses magnetic repulsion return force. Photo by N7YVX.

they "push" the paddles back to the neutral or open position.

The round base of this paddle is heavy steel, with a choice of glossy black or black wrinkle finish. Top parts are polished brass with aluminum pivots. The finger pieces are rounded triangles with a choice of plastic, ebony or pearl. Contact tension and spacing is adjusted with thumbscrews, with no tools required. Connections are made with three screwposts, requiring a flat-blade screwdriver. The paddle has a feel much like a Bencher.

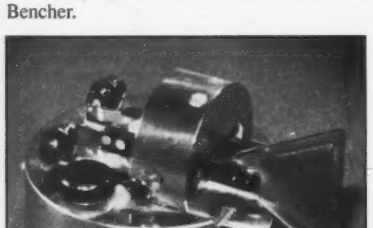

Photo R. The CW Key Siberia. This unique key (with built-in keyer) is imported from Russia. Photo courtesy of Yuri M. Sushkin of Novosibirsk-Seattle International, Ltd.

CW Key Siberia—Price TBA (Photo R). As this article was going to press, an intriguing new Russian paddle was introduced to the U.S. Called the CW Key Siberia, this paddle comes with a built-in keyer in its chrome base. It has solid silver contact points and was produced from a former military factory.

This unique paddle is being imported by Novosibirsk-Seattle International, Ltd. in Federal Way, Washington.

Before You Purchase a Paddle

I cannot emphasize enough how important it is to *try before you buy* if at all possible. The all important "feel" of a paddle can only be determined by trying it out. Many ham dealers have paddles set up with keyers (sometimes even plugged into rigs) that you can try for yourself. If your dealer does not allow you to try a paddle out in the store (hooked up to a keyer with a monitor tone) before you buy, then find another dealer who will! If you have some ham friends who have various models, see if you can get them to let you try out their paddles, preferably adjusted to your preferences. Try a few before you make a decision, and choose your paddle carefully!

Prices vary, so take your time and shop around a bit before you choose which paddle to purchase. The current selection of iambic paddles available to you provides enough choices so that you should certainly be able to find one that fits your budget and your "fist." If you find that your enthusiasm for working CW has faded, a shiny new paddle may be just the thing to renew your interest in the historic art of Morse code!

My personal thanks to all those who helped in the preparation of this article, including several manufacturers who loaned paddles for review and answered my unending questions. Thanks to Jim N7YVX for his expert photography, to Gene N9SW who kindly loaned paddles from his personal collection and thanks most of all to my wife Shelly, who patiently put up with my becoming a "computer hermit" during the writing of the article, and for her personal time spent in proofreading and suggesting many worthwhile improvements. I'll see you all on the CW bands! 73

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Bencher, Inc., 333 West Lake Street Chicago IL 60606; (708) 238-1186.

Ditek Industries Inc., 796 Merus Ct., Fenton MO 63026; (800) 762-9328.

EasyTech, 2917 Bayview Drive, Fremont CA 94538; (800) 582-4044.

Electron Processing, P.O. Box 68, Cedar MI 49621; (616) 228-7020.

G4ZPY Paddle Keys International, 41 Mill Dam Lane, Burscough Ormskirk, Lancs., England L40 7TG; 011 44 (704) 894299.

K7SRA—Don Leibrand, 360 Sheridan, #311 Palo Alto CA 94306; (415) 327-5654.

K8XF Telegraph Key Import Company, 9929 Fox Squirrel Drive, New Port Richey FL 34654; (813) 862-6328.

MFJ Enterprises Inc., Box 494 Mississippi State MS 39762; (800) 647-1800.

N2DAN—Steve Nurkiewicz, 1385 Abner Street, Port Charlotte FL 33980; (813) 743-3139.

Nye Corporation, 12031 Northup Way, Bellevue WA 98005; (206) 454-4524.

Palomar Engineers, P.O. Box 462222, Escondido CA 92046; (619) 747-3343.

R. A. Kent Engineers, P.O. Box 809, Mt. Ida AR 71957-0809.

Schurr Key, Klaus Gramowski Kaiserin-Augusta-Allee 91 D-1000 Berlin 10 Germany; 011 49 (303) 447826.

Vibroplex Company, Inc., 98 Elm Street, Portland ME 04101; (800) 262-8387.

WB4FJJ—Mike March, 1415 Greystone Terrace, Winchester VA 22601; (703) 662-4279.

Novosibirsk-Seattle International, Ltd., 429 So. 321st Place #E10, Federal Way WA 98003-8511; (206) 661-1197, FAX: (206) 946-2719. In Russia: 630092 Novosibirsk-92, P.O. Box 4. Tel: (383 2) 46-2765, FAX: (383 2) 46-0301.

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CIRCLE 159 ON READER SERVICE CARD

The Beach Brawley Boomer

QSOs made in the shade.

by Dean Frazier NH6XK

Having had a lot of fun building antennas, it occurred to me that my back-yard beach umbrella was an antenna waiting to talk. Some time ago I had loaded up the living room window frame, an old Toyota radiator, a photographic tripod, and a '77 Pinto bumper, all via a random wire tuner (L/C Box) and the tuner in my TS-440S, with some success. In none of these instances, however, had I done any real antenna calculations or trimming. Large impedance mismatches were "covered up" by the double-tuner arrangement, and it is questionable how much power was actually being radiated by these "antennas." From my QTH in Hawaii I made contacts to JA, VK, ZL, South America and the continental U.S. mainland during the peak of Solar Cycle 22, when propagation was so good on most bands that one could virtually yell out the window and be heard by DX. Now, with the solar cycle markedly on the decline, contacts while running power (the previous contacts having all been barefoot) were becoming more of a challenge. So what better time to test one's skill/knowledge of antennas? And by what more incongruous vehicle than a beach umbrella?

Photo A. The beach umbrella antenna in action.

The Beach Brawley Boomer

So named by Tony Thomas ZL2ANT ("brawley" is G-land Speak for umbrella), the Boomer measured 82 inches tall and was made of 1-1/4-inch diameter tubing in two sections, which were electrically bonded with self-tapping screws, scrap braid and wire. The umbrella's canopy measured 68 inches in diameter. Rough calculation indicated that the vertical section had about 274 ohms characteristic impedance, and its length translated into a range from 62 electrical degrees on 12 meters to 18 degrees on 40. The canopy, a disguised capacitance hat, seemed to have about 40 pF capacitance, allowing for the open structure of the ribs and the fact that the ends were not electrically hooked together. This capacitance translated into a range from 61 electrical degrees on 12 meters to 27 degrees on the 40 meter band. Surely there was an antenna here, what with the vertical tube and canopy capacitance hat just staring at me.

Further calculation showed that the umbrella should load up on 12 and 17 meters as is, fed at the base, but that some inductance would be required on 20 or 40 meters. As it turned out, base inductance loading was not needed on 12 or 17, and tuning was poor on 10 and 15 meters and marginal on 20 and 40 without a coil. Sixteen turns of #12 AWG copper wire wound on a 2-inch PVC pipe to a length of 3-1/4 inches provided almost 7 µH of inductance which, with that provided by the L/C box, allowed for tuning on 20 and 40 meters with a good match. The coil was attached to the base of the vertical tube, along with an SO239 connector, and a small pigtail of wire was soldered to the braid side of the connector to make provision for alligator-clipping quarter-wave counterpoise wires. After all, this was to be a temporary endeavor, subject to much fiddling . . . a crude blending of theoretical and empirical experimentation.

Although the Boomer was "stuck" on the roof for only one day and night (I didn't want the neighborhood association to condemn me as totally loony), I made contacts on 12, 17, and 40 meters, to ZL (Tony ZL2ANT), California (Fred N6OHH, Ron KD6FZ, Earl W6CPG, Marvin W2AH), Arizona (Link N7OAY), Kwajalein (Val V73DO), and Utah (Paul WA6EW). Also Grant VK2AXB and Cathy VK4FG joined in the fun. Contacts on 20 meters were not even tried due to the QRM, QRN, and QRC (crowding). Signal reports ranged from 4/1-5/1 on 12 meters, to 5/3-5/6 on 40, to 5/5-5/7 on 17. And all of this was during a very noisy period on the bands: 8/24/92 . . . Solar Flux 111, *Boulder A index 40*, K index 2.

Despite the poor band conditions, we had fun. Everyone seemed to enjoy talking to "that guy in Hawaii using a beach umbrella for an antenna."

Matching/Feeding/Counterpoise

The Beach Brawley Boomer was fed with 50-ohm coax through a random wire tuner. SWRs experienced were 1.1:1, 1.1:1, and 1.4:1 on 12, 17, and 40 meters respectively. During the contacts power ranged from about 70 watts to 400 watts. The cloth canopy suffered no damage at 400 watts.

I had only enough scrap wire on hand for one quarter-wave counterpoise on 40 meters, about 33 feet. I initially tried two 13-foot lengths, each a quarter wave, on 17 meters without much effect. Using this wire plus some other odd bits and pieces soldered together gave me one 33-foot length which helped greatly on 7 MHz as well on the higher bands. It's amazing to me that the Boomer worked as well as it did with just one counterpoise. No umbrella trimming was done . . . I still needed it for the back yard!

So what was the point of all of this? To have a bit of fun, of course. The Beach Brawley Boomer doesn't compare with my R5 (12/17 meters) but it did about as well as my 40 meter dipole. Very unscientific "test-

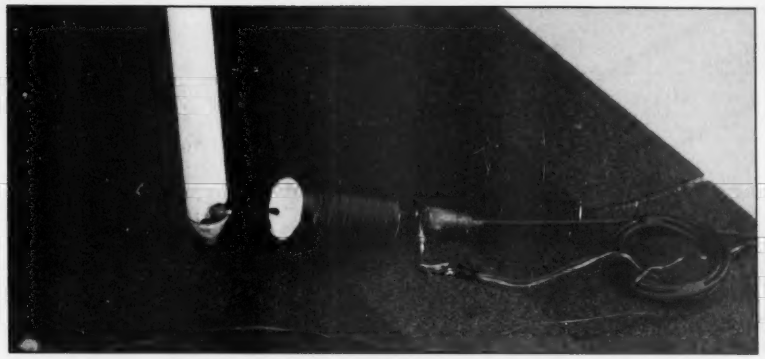

Photo B. The beach umbrella antenna feedpoint.

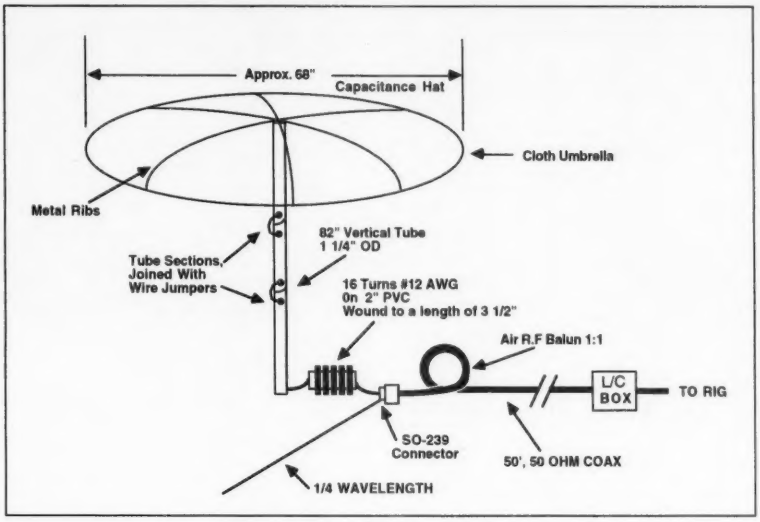

Figure 1. Diagram of the beach umbrella antenna system.

ing" was done, if any was done at all. The point was to have fun and to demonstrate that almost anything can be loaded up and be made to "talk."

Of deeper significance, however, was the demonstration of "Antenna in an Emergency." To me, and I think to many hams, when your antenna is "down" that is indeed an *emergency*. I know of one particular ham, a good friend of mine, who is very dependent on the weather for operation. When the wind blows, down comes the tower, down comes the beam antenna, and my friend goes QRT. But a good stout vertical will stand all but the most ferocious of winds (Hurricane Andrew?) and allow some degree of operation. So, although it would seem that the exercise with the Beach Brawley Boomer was purely for fun, the real ulterior motive behind it all was to show that an emergency antenna, even an umbrella, can allow operation to continue.

It is my opinion (please allow me while I'm on the soapbox) that a vertical of some kind, if only used as an emergency standby antenna, is fundamental, a prerequisite to any ham's family of antennas. Why, even a beach umbrella will do in a downpour.

BEACH BRAWLEY BOOMER DATA

Band (meters)	Frequency (MHz)
12	24.985
17	18.113
40	7.163

ELECTRICAL LENGTHS, DEGREES*

Vertical Tube	Canopy Hat	Coil	Total	Approximate Total Wavelength
62	61	15	138	3/8
45	53	17	115	1/3
18	27	42	87	1/4

*Note: For calculations and formulae, see *QST*, September 1978 (Walter Schulz K3OQF), regarding capacitance hat loading; and *The ARRL Compendium Vol. 1* (Bruce Brown W6TWW) regarding the base loading coil design.

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CIRCLE 153 ON READER SERVICE CARD

CARR'S CORNER

Joseph J. Carr K4IPV
P.O. Box 1099-0099
Falls Church VA 22041

We would like to welcome our newest columnist, Joe Carr K4IPV, to 73. *Joe has been a ham since 1959 and is the author of over 80 books, including* Secrets of RF Circuit Design *and the* Practical Antenna Handbook. *He has written over 450 articles, mostly about radio and electronics.*

A New *73* Column!

Guess what? I'm back! Readers who remember my long-running column, "Practically Speaking," that appeared in the now defunct *Ham Radio* magazine will, I hope, be pleased to see that my column is now in *73* under a different title. This column will deal with a lot of different topics, but all will have some technical aspect of ham radio as the central theme. Some columns may include a product review or two, while others will be small construction projects.

There will also be a few tutorials on one technical aspect of radio or another, although the general thrust will be practical rather than material laden with math and deep theory. From time to time we will take a look at antennas.

I welcome your suggestions. You can send recommendations for topics, complaints, kudos, brickbats and whatever to me either care of the editor, or directly at P.O. Box 1099, Falls Church VA 22041-0099. Or just come up to me at a hamfest if you see me . . . I'm friendly enough and love to rag-chew. This month, we will take a look at how to use the MAR-x series of silicon monolithic microwave integrated circuit chips (MMIC) available from Mini-Circuits Laboratories, Inc.

The MAR-x Series

The MAR-x series of devices are small ICs that will operate at frequencies from DC to either 1,000 MHz or 2,000 MHz, depending on the type number. The actual type number will be MAR-x, with the "x" replaced by 1, 2, 3, 4, 6, 7, or 8. Table 1 shows the characteristics of MAR-1 through MAR-8, including maximum operating frequency, noise figure and the gain at 500 MHz (gain is slightly higher at 100 MHz, and less at the high end of each device's range).

Figure 1 shows the package of the MAR-x devices. Note that it looks a bit like a small-signal RF or microwave transistor, even though it is an integrated circuit. There are only four leads, labeled 1 through 4: RF INPUT (lead 1), GROUND (lead 2), RF OUTPUT (lead 3) and another GROUND (lead 4). The RF input (lead 1) is marked by two keying devices: a color dot and a beveled tip on the lead. The color of the color dot indicates the type number of the dot (also tabulated in Table 1).

An interesting feature of the MAR-x devices is that their internal circuitry makes both RF input and RF output a good match to 50 ohms. Because of this feature, the MAR-x devices can be used for both tuned and wideband applications, depending on the input and output circuitry selected. For a wideband amplifier, it is only necessary to capacitor-couple the input and output leads directly to the input and output jacks.

Figure 2 shows the basic circuit for the MAR-x devices. The input and output circuits consist of capacitors C1 and C2, respectively. These capacitors can be 0.001 µF disk ceramics in the 80 meter to 6 meter range, but should be chip capacitors if the desired upper frequency band is 2 meters or higher. For amplifiers that operate only from 2 meters and up, use 100 pF chip capacitors.

The DC power to the MAR-x devices is passed to the chip via the RF OUTPUT terminal, lead number 3. The MAR-x devices operate from low voltages. The MAR-x device wants to see +5 volts, while other types demand from +3.5 to 7 volts. In order to operate the MAR-x devices from higher voltage DC power supplies, use a series resistor (R1) to drop some of the voltage. The value of the resistor is determined by the supply voltage (Vdc) and the set current, which is a function of the device type. For the popular MAR-1 device, which operates to 1,000 MHz, the usual current drain is 15 mA, or 0.015 amperes. The value of the resistor (R1) is:

$$R1 = \frac{Vdc - V}{I} \qquad (1)$$

For example, consider a case where the MAR-1 is to operate at 15 mA from a voltage source of +12 volts DC. The resistor should be:

$$R1 = \frac{(12) - (5)\ volts}{0.015A} \qquad (2)$$

$$R1 = \frac{7V}{0.015A} = 467\ ohms \qquad (3)$$

Of course, a 467-ohm resistor is a little hard to come by, so use a 470-ohm resistor instead . . . besides, it is likely that a 5% tolerance 470-ohm resistor will have some value closer to 467 ohms anyway.

Sometimes, an optional RF choke (RFC1) is used between the resistor and the MAR-x device. This choke should have a value between 1 µH and 1,000 µH, depending on the desired frequency range. Many people might prefer to use a ferrite bead (F.B.) slipped over the lead of the resistor instead of the RF choke (see inset to Figure 3). These beads are available from Amidon Associates (P.O. Box 956, Torrance CA 90508).

Figure 3 shows a typical layout for a printed circuit board. I built a couple of sample circuits while preparing for this article, not with PCBs but with perforated board and adhesive-backed copper foil (the kind used to make pseudo "printed" circuit boards). In order to make 50-ohm striplines for the input and output lines on G-10 Epoxy/Fiberglas™ board, use a width ("W") of 0.108 inches.

The MAR-x devices are a very handy way to obtain either wideband RF amplifiers or tuned amplifiers. Tuning is accomplished by adding either bandpass filters in the input and output networks, or a single-frequency LC-tuned tank circuit.

The really neat thing about the MAR-x device is its low cost. The price of the MAR-1 (1000 MHz) device is about $1.25 (quantity of 10). Mini-Circuits, Inc. also offers a designer's amplifier kit (product number DAK-2) that offers five of each model, for a total of 35 devices, at $59.95. Plenty of devices for experimenting!

Table 1. The MAR-x Series.

Type	Color Dot	500 MHz Gain (dB)	Max. Freq.	N.F. (dB)
MAR-1	Brown	17.5	1,000 MHz	5.0
MAR-2	Red	12.8	2,000 MHz	6.5
MAR-3	Orange	12.8	2,000 MHz	6.0
MAR-4	Yellow	8.2	1,000 MHz	7.0
MAR-6	White	19.0	2,000 MHz	2.8
MAR-7	Violet	13.1	2,000 MHz	5.0
MAR-8	Blue	28.0	1,000 MHz	3.5

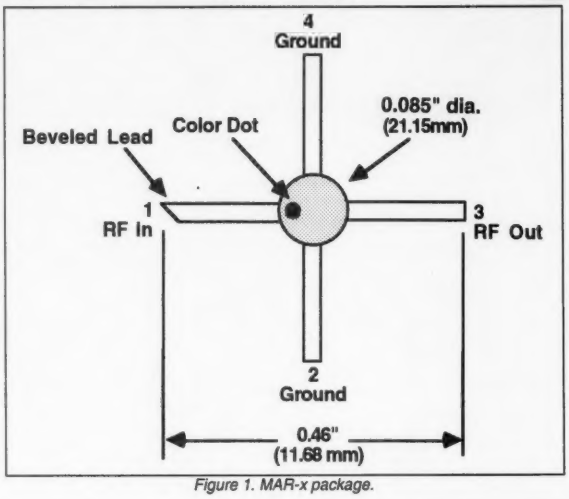

Figure 1. MAR-x package.

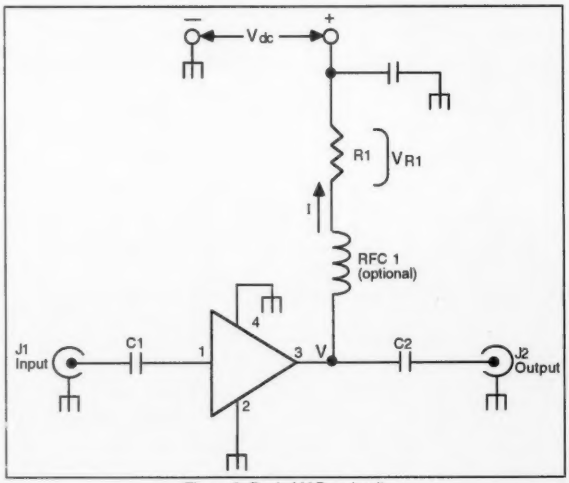

Figure 2. Basic MAR-x circuit.

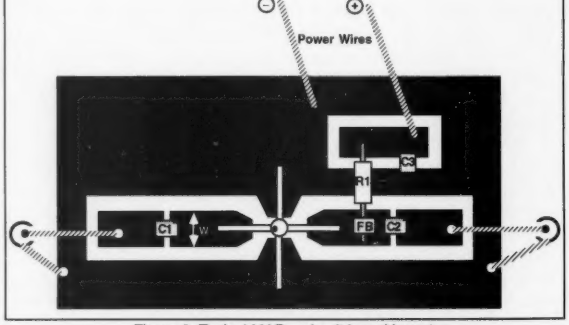

Figure 3. Typical MAR-x circuit board layout.

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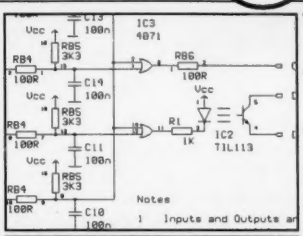

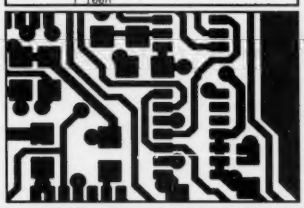

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73 Review

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Price Class: BP-1 with BayCom vers. 1.4, $49
BayCom vers. 1.5, $20 option
C-64 Adaptor, $20 option

How would you like to get on packet radio for under $50? If you have an IBM compatible computer laying around, you only need to add the BayPac model BP-1 Packet Modem and run a software packet program. It's that easy!

The folks at Tigertronics have designed their BP-1 packet modem to operate with the popular BayCom program (written by DL8MBT and DG3RBU in Germany). Essentially, BayCom (and others such as SofTNC) takes all of the functions of a packet terminal node controller (TNC) and does it in software. You only need an external modem to operate packet with a computer running the BayCom program.

With the addition of a very small interface between the computer and the real world (your VHF rig), you now have a full-featured packet station.

Photo A. The Tigertronics BP-1 Packet Modem fits in a case the size of a DB-25 connector housing.

The BP-1 Packet Modem

The BP-1 modem comes in a case no bigger than a DB-25 connector housing. The top of the case is clear and allows you to see the inner circuitry (a nice touch that is certain to elicit a few admiring comments from your fellow packeteers).

The BP-1 is designed to plug into your computer's serial port. You can use any COM port by changing a configuration file in the BayCom (or SofTNC) program. For those of you with 9-pin serial ports (AT machines or laptops), you will need to use a 25-pin to 9-pin adaptor or cable (available as an option).

Your HT or home station hooks up to the BP-1 via a telephone-style cable with an RJ-11 telephone jack. Since the BP-1 was designed to minimize RF radiation from its circuitry, you can use unshielded telephone line (up to six feet) with no ill effect. This allows you to make up several cables for different radios using inexpensive telephone cables, and to quickly change them via the BP-1 quick-connect socket.

Also, for those of you with Commodore C-64s, the BP-1 modem will work with the DigiCom packet program through the use of a $20 adaptor.

No Batteries!

The BP-1 uses a custom modem IC that draws a fraction of the current of the other popular modem ICs (less than 2 mA). As a result, you can power the BP-1 directly from the voltage present on your computer's serial port. Even laptops with low serial port current handling capabilities provide enough power to operate the BP-1.

Interfacing to Your Rig

The BP-1 manual shows the proper method to hook up the interface cable from the BP-1 to your HT or home rig. Since a number of HTs use a PTT keying resistor on the audio line, the BP-1 includes a built-in keying resistor that you can activate through the use of a plug-in shorting jumper. This eliminates the need to wire up the keying resistor in the wiring harness or jack. Although the 3.0k value works for most HTs, yours may require a higher value. In this case you will have to wire an external resistor in line and leave the jumper shunt unplugged.

The program disk included with the BP-1 has a file called "Hints.doc" which contains pinouts and wiring examples for most popular radios. Tigertronics also has a support line that you can call to get you up and running. It's manned by a live technical staff from 1:00 to 5:00 p.m. Pacific Time. At other times they have an automated tech support line with recorded messages that you can select from a touch-tone menu. These messages contain wiring diagrams and pinouts for most radios and answers to some of the most common questions.

Some folks may be concerned about the use of unshielded telephone cable between the BP-1 and the radio (see Figure 1 for a suggested connection to an HT). The BP-1 was designed to minimize RF interference to your rig from both the modem and your computer (it's even FCC emission-certified). The modem crystal frequency was chosen to put harmonics outside of any packet frequencies. The only problem area is the situation where you have your transmit antenna too close to the BP-1 (such as using an HT with its rubber duck antenna). Tigertronics strongly recommends that you use a remote antenna (at least six to 10 feet away from your radio). This will prevent RF from getting into the interface or your computer. In extreme cases running higher power, you may need to use shielded cable for the interface leads (the manual shows a wiring example).

On The Air

There are only two adjustments necessary to set up the BP-1 for your particular radio. First, you may have to adjust the "Level" control for a transmitter deviation of 4 kHz. The Level control is a small pot recessed in the end of the BP-1. The factory level setting should be already be correct for the majority of rigs; I didn't have to adjust it during my tests. Finally, you need to set up your receive volume to a 1-volt p-p output (about two-thirds volume on most rigs).

Of course, the first on-the-air test I performed was to operate the BP-1 packet system with my HT (with rubber duck) operating next to my computer (not recommended). Even with the unshielded phone cable interface, I didn't notice any problems with RF getting into the modem or the computer. However, my computer produces a lot of interference in the 2 meter band so only the strongest local packet stations could get through. I did some tests comparing a shielded interface cable vs. the unshielded telephone cable and could detect no noticeable difference in performance.

Next, I tried three different remote antennas: a Pico-J by Antennas West, my Larson quarter-wave mag-mount (sitting on my refrigerator for a ground plane) and my rooftop vertical.

The Pico-J is a J-pole attached to about six feet of miniature coax. Getting the antenna that far from my computer and rig really helped a lot. Only a small amount of computer hash

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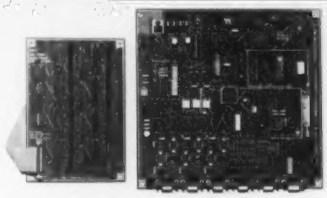

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was detectable and packet operation was possible with all but the weakest stations. My refrigerator-mounted mag-mount (use a good ground plane when using a quarter-wave mag-mount), as well as the rooftop vertical, eliminated virtually all of the hash and I was able to make packet connects with just about any station I could hear.

The BayCom Packet Program

The BP-1 comes with shareware version 1.4 of BayCom. This is a full-featured packet program that offers three different windowed displays on the main screen: the top window is the outgoing keyboard buffer; the middle window shows the current conversation; and the bottom window shows status lines and frame info. BayCom allows you to establish eight different conversations at a time, gives others the ability to use you as a digipeater, and has an excellent help screen function to guide you through all of the different features. You can also easily capture any files to disk.

The BayCom manual comes on disk. When you print it out, make sure you have a lot of paper in your printer as it's a real doozy! Since most people initially find the BayCom manual overwhelming, Tigertronics includes a file called "Commands.doc" on the program disk which contains a summary of all the important BayCom commands, what to do with them and how to get started with your "first connect." The BayCom team has spent a lot of time and effort to make this a versatile program. The updated version 1.5 is now available as a commercial product (also available from Tigertronics).

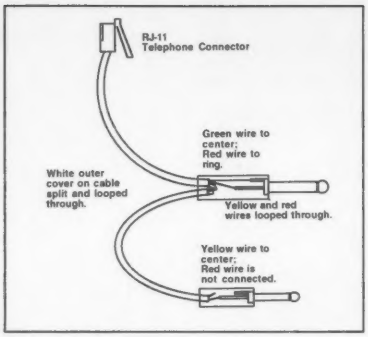

Figure 1. Suggested wiring diagram for a typical HT interface using the telephone-type cable supplied with the BP-1.

SofTNC

The BP-1 modem is also compatible with another program designed for the BayCom style modem. One such example is SofTNC by j•Com. SofTNC is a streamlined program designed to get you up and running with minimum fuss and bother. It allows one connect at a time and has good text capture and storage capabilities. Although it doesn't have the bells and whistles of the BayCom program, it is very easy to understand and use. Those of you familiar with the popular PMP program (see "Poor Man's Packet," *73 Amateur Radio Today*, August 1991, p. 8) will recognize that SofTNC has the same command structure and configuration parameters. SofTNC was written by Andy Payne N8KEI (the author of "Poor Man's Packet") specifically for j•COM for use with BayCom-style modems.

Conclusions

Operating packet with the Tigertronics BP-1 and either of the software packages was a lot of fun. It was amazing just how well this miniature interface worked. I couldn't tell that there wasn't any TNC in the system at all. I tried the BayCom program on several different types of PC compatibles (and original IBMs) with no problems. The ultimate test was getting the program to work on my speed-demon 4.77 MHz AT&T 6300, although there was some random snow zipping across the menu screen. I've heard that there are some laptops and some 386SX machines that will not work properly with one or both of the programs. Usually, if your computer will not operate with BayCom, the SofTNC program will work (or vice versa). Although rare, I can't rule out the possibility that there may be some machines that won't function with both programs.

I really enjoyed the capabilities of both programs. The combination of BayCom (or SofTNC) with the BP-1 modem gave me a versatile packet station with the ultimate in portability. 73

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SS-50

It should be snowing now in many parts of the country. Other areas have their snowbirds arriving. Here in Baltimore, well, we haven't had a white Christmas in many years. Nonetheless, I do pass along greetings for the season, with Channukah and Christmas wishes to each and every one of you.

Here's a letter from Roy Baumiller, Jr., WB3HDZ of Everett, Pennsylvania. He relates that it has been a while since he last wrote, dating that back to the time I was rabble-rousing for a 6809 program for RTTY. He also seconds the suggestion that those hams using VIC computers "stay with it" and not immediately jump ship to larger systems.

The most impressive story told in the letter, though relates to mechanical teleprinters. It seems that this past year, Roy had an opportunity to attempt to copy the Armed Forces Day RTTY test in an "all computer mode." He describes being helpless, then a voice signal came up on frequency (this is quite common with some of the MARS frequencies). There was no margin for distortion. "If I had had my 390A, Dovetron, and a Model 28RO, I would have had it. But I couldn't use narrow bandwidth with the RTTY program, so on wide I lost signal at each static crash, etc. Disappointed and frustrated to say the least."

I guess that's the same reason I keep a typewriter in the office, and why I drop to DOS routines when there are Windows versions of the same program. If it ain't broke, don't fix it!

Roy also says he is looking for anyone who still sells, uses, or services SS-50 computers. As a "diehard 68xx'er on SS-50," Roy is becoming frustrated looking for suppliers. For those of you who have no idea what SS-50 is, early home computers were built on a motherboard/bus design. While the most popular of these was the S-100 bus, around which the popular Altair, Imsai, and other 8080 or Z-80 systems were designed, systems using Motorola architecture, beginning with the 6800 CPU, used a 50-line bus, commonly called the SS-50. Why "SS"? The originator of the system was a company called Southwest Technical Products, Inc., but the first practical accessories were from a company called Smoke Signal Broadcasting. Smoke Signal = SS! Anyway, the SS-50 computers created an active side spur of personal computers. At its peak, we were running a multi-tasking, multi-user operating system on 6809 computers, called "OS9." Hmmm . . . I wonder if that name ever spawned any offspring? Anyway, if any of you out there are still running SS-50 systems (mine is in the basement gathering cobwebs), or OS9, or know what happened to SWTPC, SSB, 68 Micro, or others of the time, drop us a note. Both Roy and I are interested to hear the tales.

ARC, ZIP, and Other Oddities

For several months now, I have been offering a collection of programs for IBM compatible programs for RTTY, packet, and other ham functions. I supply these programs in archived form. Apparently, quite a few of you are not familiar with these types of programs, and have expressed this to me in quite a few letters. So, to help explain what I'm talking about, and how to use these and many other programs you might download from a BBS or obtain on a "shareware" disk, I herewith provide the following introduction to archives.

In the dim, dark, past of computer communication, back when we all communicated at 110 baud, or an adventurous few at 300 baud, sending a program might take quite a bit of time. Moreover, if you had a set of programs that worked together—say a program, data file, and documentation file—you might be interested in a way to combine them into one file for transfer.

Many such techniques have been developed over the years. One of the earliest was the "library" concept (denoted by a filename with the extension ".LBR"). Following this lead, all current archiving utilities use the filename extension to indicate the type of archive in use. So, for example, if you had a word processor, called WRDPRC.EXE, and a document file, called WRDPRC.DOC, you might join them together in a library called WRDPRC.LBR.

While the library concept was one of the first, if not the first, practical archivers in use, it has been supplanted by and large by three major, and several minor, protocols. The .ARC extension indicates a file compressed by either the ARC program, produced by Software Engineering Associates, or an older program written by Phil Katz, called PKPAK. Well, PKPAK was originally called PKARC, but SEA, the inventors of the ARC format, objected, and Phil first changed the name of the program, then devised an entirely new scheme, ZIP. Files with the .ZIP extension have been encoded with Phil Katz's PKZIP routine, perhaps the most popular compression and archiving utility in use. Another major player comes from Japan. Originally called LHARC, and now just LHA, files compressed with this powerful program may be identified by a .LHZ extension.

As I indicated, there are some other, less often seen, programs out there as well. A .PAK extension relates to a program of the same name, as do the .ZOO extension and .ARJ extension. Each scheme has its proponents and favorites, and each one may have some advantage, even slightly, over the others.

No matter which routine you are using, decoding the programs is pretty much the same thing. You should type the name of the decoding program, any required switches, and the filename, without the extension, of the archive to be decoded. So, if you wanted to dearchive a file (let's call it RTTY.ARC, or RTTY.ZIP, or RTTY.LHZ) for the three major programs, you would type the following command (shown in bold):

For RTTY.ARC use **ARCE RTTY**
or **PKUNPAK RTTY**
For RTTY.ZIP use **PKUNZIP RTTY**
For RTTY.LHZ use **LHA E RTTY**

Now, command-line switches and the like can be daunting to anyone. Therefore, there are programs that isolate you from the program itself and take care of all the compression for you! One of the most useful of these is called SHEZ. Once configured, a procedure performed by answering questions the program asks at first startup, SHEZ will dearchive any of these programs. It does this in a <<shudder>> user-friendly, point and shoot environment.

One last hitch in all of this. Sometimes archived programs are distributed in "self-extracting," also called SFX, format. Here, a small integral decoder has been added to the archive, and the file extension has been changed from ARC, ZIP, LHA, or the like, to EXE so that a big archive called RTTY.ZIP can be transformed into an SFX archive called RTTY.EXE. Typing RTTY will then lead to automatic extraction of the archive, no decoder needed. Yes, SHEZ can handle those, too.

Hopefully, this will give you the base information to deal with the variety of archived programs out there. To facilitate this, I will go ahead and put together a collection of these archiving programs for you and make them available per the usual offer. Simply mail me a high density disk, either 5" 1.2 Mb or 3.5" 1.4 Mb, a self-addressed, stamped disk mailer for its return, and two dollars in US funds, and I'll send you the archiving utilities. Be sure to specify now, when you mail me a disk, whether you want the latest RTTY programs or archive utilities, otherwise who knows what you'll get back!

In the meantime, I look forward to your questions and comments. Please send them via US Mail to the above address; CompuServe at ppn 75036,2501; Delphi at username MarcWA3AJR; or America Online at screen name MarcWA3AJR. I read them all, look forward to them all, and who knows—you might just find your name here in "RTTY Loop."

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ATV Repeaters

A lot of folks ask me for info about putting up an ATV repeater system. As a result, I'll be periodically featuring different repeater systems and how they are put together.

Recently I dropped in on an ATV repeater system that we can actually work from the *73* hamshack, even though it is about 60 miles away (mountains are a great place for a repeater tower).

The KC1RH ATV Repeater

Located atop a 1230-foot foothill near Leyden, Massachusetts, this repeater covers the tri-state area of western Massachusetts, southeastern Vermont and southwestern New Hampshire. With a good view of the Connecticut River Valley, the KC1RH machine has been received as far south as Connecticut.

Ed Skutnik KC1RH installed the repeater at the site of his commercial FM radio station (WRSI—95.3 MHz). The repeater has an input on 434.0 MHz with two outputs on 421.25 and 1241 MHz. The receive/transmit sections are all PC Electronics repeater modules (ATVR-4, RTX-70 and RTX-23). He has a pair of four-bay Sinclair SRL 310C-4 vertically polarized antennas at the 170-foot level of the tower (receive) and 120 feet (421.25 MHz transmit). In addition, a Diamond BDY-1218 omni-directional vertical was installed at 145 feet for the 1241 MHz output. With the exception of the 1241 MHz transmitter, all coax runs are Cablewave 7/8" hardline (see the repeater block diagram in Figure 1). Input filtering is performed using an International Crystal VSB filter (model FL407) and output filtering is done with Spectrum International VSB filters for both 421.25 (PSF-421-ATV) and 1241 (PSF-1241-ATV) MHz. The output power on 421.25 MHz is 100 watts (using the repeater version of the Mirage D-100 amplifier); only 1.5 watts are available on 1241 MHz.

When video sync is detected by the PC Electronics VOR-2 (video operated relay), DC power is applied through a bank of relays to the transmit modules. Through a touch-tone decoder (Hamtronics TD-2) and relay board, different transmitters and video feeds can be selected (see Figure 2). The default setting turns both the 421.25 and 1241 MHz transmitters on whenever a received video signal trips the VOR. In the future, Ed plans to install a second receive frequency to link up with the W1HGJ ATV repeater on Soapstone Mountain, Connecticut (426.25 MHz output).

Local Activity

The WB1GUY 2m repeater on 146.985 (-600) is used as the local ATV talk frequency. A PL tone (4Z) is sometimes required when interference is severe from distant repeaters. Since the 2m repeater is co-located with the ATV repeater, a touch-

Photo A. Ed Skutnik KC1RH demonstrates the operation of his ATV repeater located on a 1230-foot hill near Leyden, Massachusetts. The repeater covers the tri-state areas of western Massachusetts (the Connecticut River Valley), southeastern Vermont and southwestern New Hampshire.

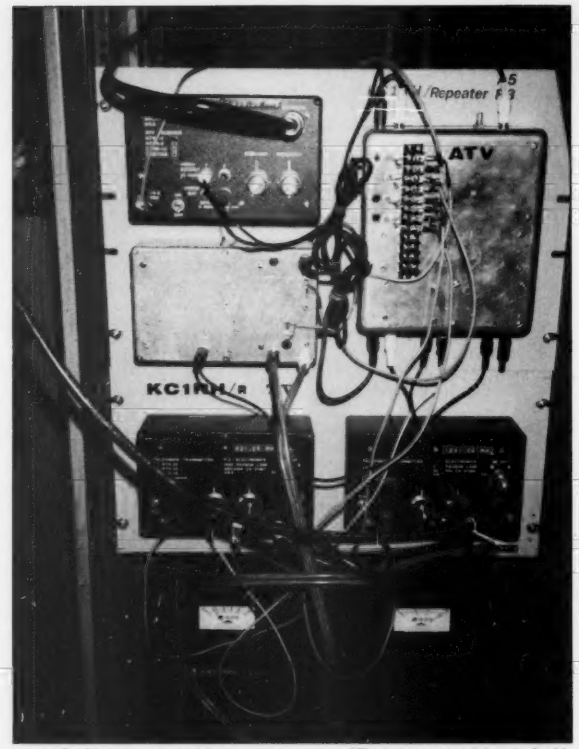
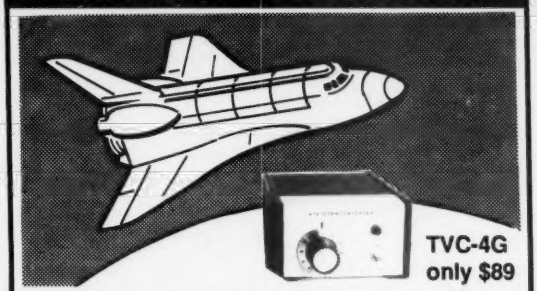


Photo B. Close-up view of the neatly arranged ATV repeater modules. Left side (top to bottom): 434 MHz receive, video operated relay/video ID and 421.25 MHz transmit. Right side (top to bottom): touch-tone controller/relay control box and 1241 MHz transmit. A 50-amp Astron power supply and the Mirage D-100TVNR 100-watt repeater amplifier are shown on the bottom of the rack.

Photo C. Internal view of the touch-tone controller and relay box.

AMATEUR TELEVISION



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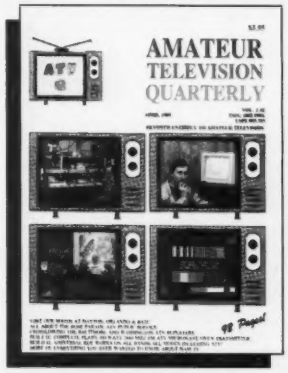

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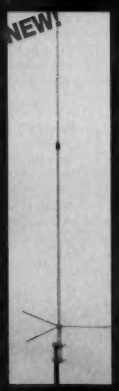

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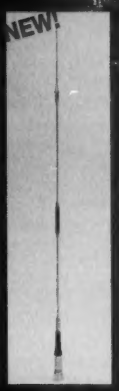

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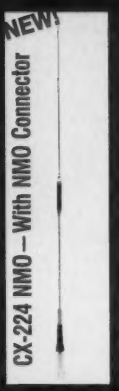

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Max Power:
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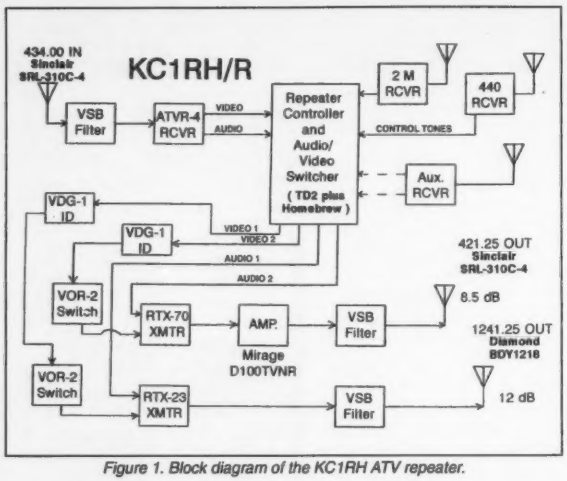

Figure 1. Block diagram of the KC1RH ATV repeater.

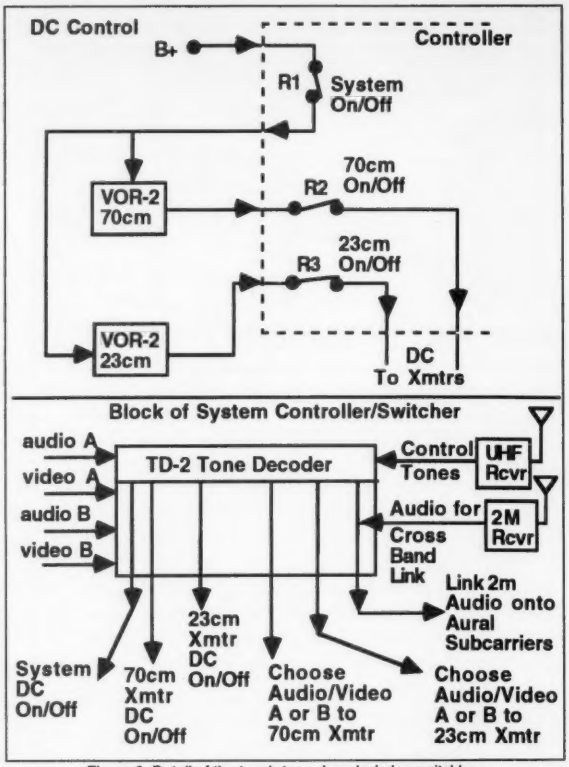

Figure 2. Detail of the touch-tone decoder/relay switchbox.

tone command can actually link the audio from the 2m repeater through to the ATV subcarrier. Usually a call for ATV activity will net you one of the local ATV operators.

Some of locally active ATVers are Bill Boutwell N1EWK and Perry Cole N1EWL in Greenfield, Massachusetts; Ken Heile W1GZT in Guilford, Vermont; and, of course, Ed Skutnik KC1RH in Sunderland, Massachusetts. If you'd like more information about the KC1RH repeater or activity in the area, feel free to contact Ed Skutnik KC1RH, 58 Reservation Rd., Sunderland MA 01375. Please enclose an SASE for a reply.

Let's Hear From YOU!

I'd like to hear from some of the ATV repeater groups out there. Send me some photos, a block diagram of your system and some info about your group's activities and I'll be happy to share this with *73* readers. Let me know if you've come up with a circuit or a technique to solve a nagging repeater problem.

If your ATV group is involved in an event, emergency or some unique activity, send in a writeup and photos for possible use in a future column. Also, feel free to share any circuits or antennas you've designed or modified that you feel are particularly useful for ATV.

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An Expanded-Scale Voltmeter

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William Call KJ4W

Like many amateurs, I use a 12-volt deep-discharge lead-acid storage battery to power my base station radio equipment. This method has the advantage of providing emergency operation in case of a power failure without having to connect and start a generator immediately, and without having to reset computer-based equipment. It also partially isolates the battery-powered equipment from the power line, reducing the chances of damage during thunderstorms or from other line transients. Battery operation allows the use of a comparatively low-amperage 12-volt power supply or battery charger. High current demands during transmit can be supplied by the battery, which is then gradually recharged during receiving periods. The battery can be constantly recharged using a floating-type power supply, or a higher-current charger can be manually or automatically switched in and out. (An automatic charging controller was described in *73 Amateur Radio Today*, May 1992, by WBØTCZ.)

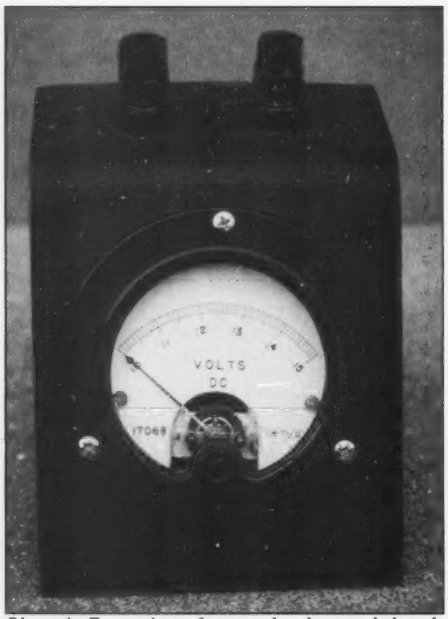

Photo A. Front view of a completed expanded-scale voltmeter, mounted in a metal case. The original 0-5 volt DC meter was modified by inking a "1" before each digit.

It is desirable to constantly monitor the condition of a storage battery, i.e. its terminal voltage, when it is used this way, to make sure that the battery is not overcharged or too deeply discharged. It is difficult to use a standard voltmeter with a moving pointer for this task because the useful voltage range becomes compressed into a small portion of the meter's scale, making reading the meter difficult. For example, if a 0- to 15-volt meter is used, the useful portion is from about 10 or 11 to 15 volts; the bottom two-thirds of the meter's range is not used (it would damage a lead-acid battery to discharge it below 10 volts, besides the fact that little useful power would be left). Trying to distinguish precise values in that useful upper third of the scale is difficult. One solution to this situation is to use a digital voltmeter, but even though these are dropping in price they are still fairly expensive, particularly if there is a mostly-junk-box solution available. Indeed there is—a standard analog voltmeter can be converted to an "expanded-scale" meter using the methods outlined in this article.

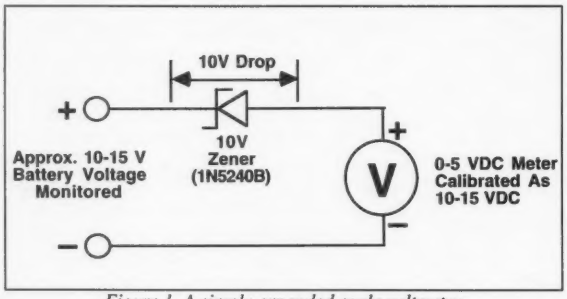

Figure 1. A simple expanded-scale voltmeter.

Converting a Standard Analog Meter

An established way of making an expanded-scale voltmeter is to place a zener diode in series with a voltmeter of smaller range. For example, see Figure 1: A 1N5240B 10-volt zener is placed in series with a 5-volt full-scale voltmeter. The meter will not respond at all until the input voltage reaches at least 10 volts and the zener starts conducting, so the left-hand end of the meter's scale represents 10 volts or below. Any input voltage above 10 produces a proportional increase in meter reading; full scale deflection occurs with 15 volts input, which produces 5 volts across the voltmeter. This is a particularly easy conversion to make: The meter can be opened up and the scale easily modified by placing a "1" before each digit of the 0-to-5 scale, thus relabeling the scale 10 to 15 volts, with no other meter modifications needed.

Though apparently easy to accomplish, this method is disappointingly inaccurate. The weak point is the drop across the zener; it won't be a constant 10 volts, or probably 10 volts at any time. Since most voltmeters are high-resistance by design, the zener current will be much lower than its "test current," which is the point where its voltage drop should be equal to 10. In this example, for the 1k ohm/V meter used, the meter's internal resistance will be its full-scale rating of 5V times 1k ohm per volt, or 5k ohm; or, 1 mA full-scale current. The maximum zener current will be this 1 mA, far below the 1N5240B's test current of 20 mA, and of course the current varies by a large factor over the meter's range. Therefore, the zener voltage will probably be below 10, and will vary some. In addition to these problems, the zener has a tolerance, or stated initial accuracy: The 1N5240B is rated as 5%, or plus or minus 0.5V, from 10V. Most other 10V zener part numbers have even worse accuracy, perhaps 10 or 20 percent.

Testing

To determine how well, or how poorly, the simple expanded-scale meter worked, I selected three new 1N5240B zeners at random and breadboarded the circuit and checked the zener drop and meter readings with a good-quality digital multimeter (the 5-volt meter was first checked and found to be quite accurate). Over the meter's range, the actual zener voltages varied only by 10 mV on the best zener, by 40 mV on another, but by 120 mV on the worst. However, all zener drops were well below 10 volts, with an average of 9.46 volts at mid-scale. This would produce an average error of over half a volt. The worst zener's drop was 9.34 volts, for a mid-scale error of 0.66 volts. There's no easy way to reduce the error because a zener isn't adjustable. The scale could be painstakingly recalibrated using the DMM, but that's no fun, nor would it be attractive.

To improve accuracy and provide for easy, precise adjustment, I developed the circuit shown in Figure 2. Two inexpensive three-terminal IC voltage regulators are used, provid-

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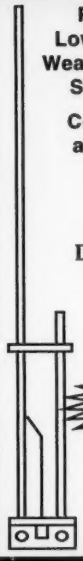

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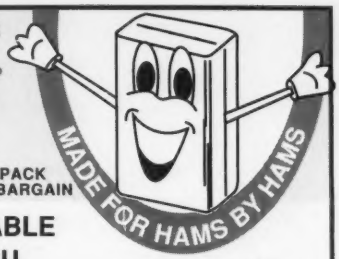

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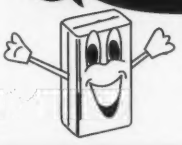

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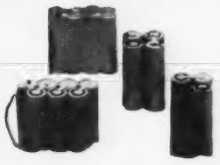

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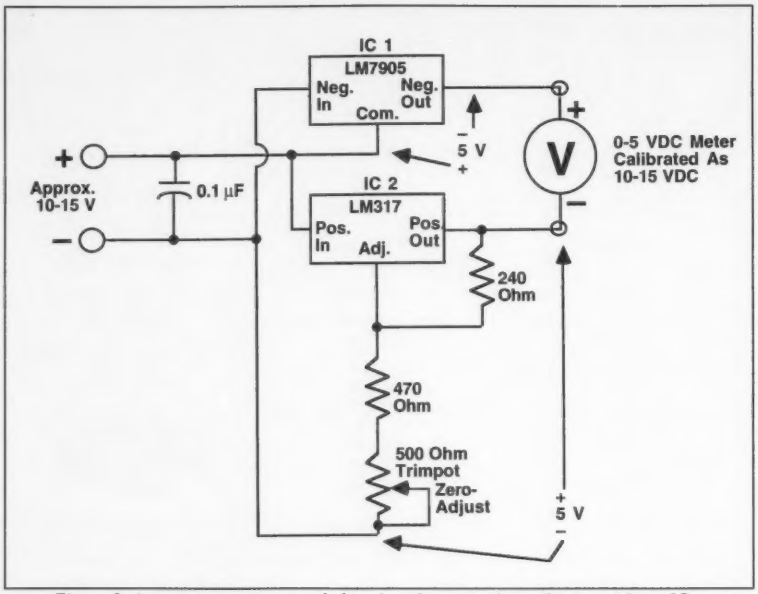

Figure 2. A more accurate expanded-scale voltmeter using voltage regulator ICs.

ing accurate scale expansion and a trimpot for calibration. The "trick" in this circuit is the unusual way IC1 is used: This is a negative-supply regulator, used in an inverted fashion. Its output voltage is negative 5 volts with respect to its common reference, which is connected to the positive input voltage, while its negative input is connected to the negative side of the input voltage. The upshot of this is that IC1's output with respect to circuit common (the negative input voltage) is always 5 volts below the positive input. In other words, as the input varies from +10 to +15VDC, IC1's output varies from +5 to +10 VDC with respect to circuit common. IC2 provides a constant +5 VDC with respect to circuit common; the voltmeter is connected between the regulator outputs, so it "sees" 0 to 5 volts as the input varies from 10 to 15 volts. Therefore, the expanded-scale meter results.

It is tempting to consider eliminating IC2 and changing IC1 to a 7910, producing a 10-volt drop directly. The problem is that IC1, like many regulators, requires a minimum of 1.7V more input than output, so then the meter wouldn't be accurate below 11.7 volts input. IC2 provides an inexpensive reference at +5V to solve the problem, with the additional 5-volt offset of IC1 adding up to the 10V drop needed. Since both ICs are operating as 5-volt regulators, the accuracy is fine to well below 10 volts input.

IC2 is shown as an adjustable regulator, rather than fixed, to allow precise trimming at the zero, or 10-volt, end of the meter scale. The data book says that a minimum load current for a LM317 of 3.5 mA typically is required to maintain accuracy; the meter will usually draw less than this. However, I experienced no problems. A load resistor could be added if needed.

IC1 could be changed to an LM337 negative-voltage variable regulator, if desired, to provide a full-scale trim as well; or the meter's dropping resistance could be varied to accomplish calibration at full-scale. Using a

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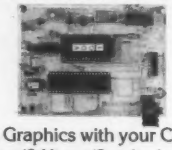

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partly-variable meter dropping resistance to provide full-scale trim is discussed in the section on selecting meters. In the example pictured, the 5-volt meter's accuracy was so good that full-scale trimming was unnecessary. Measured error was less than one minor division (0.1V) anywhere in the meter's range.

Since the meter current is low, the regulator ICs can be either the low-current types or the more common TO-220 package types; no heat sinks are needed. Since any of several regulator packages might be chosen, a pictorial wiring diagram has not been shown. Point-to-point wiring on a perf-board is very practical; just make sure you have the proper pin configuration for your regulator packages, and follow the wiring shown in Figure 2. Photo B shows a completed meter, mounted in a cabinet, with the circuit of Figure 2 mounted on a perf-board attached to the meter terminals. This unit was built using one low-power (TO-92) package and one TO-220 package (what I had in the parts drawer). The zero-adjust pot is visible on the lower left.

The front view, Photo A, shows the slightly modified scale to the original 5-volt meter (the hand-inked "1's" were added before the original numbers), as discussed earlier. Though not shown in the picture, an inline fuse (1/2 amp was used) is in the circuit wiring between the battery and the meter. Always provide a fuse in any circuit attached to a storage battery; if anything shorts and you don't have one, that battery's high current capability will get you in serious trouble very quickly! The meter can be left on continuously; its current consumption is about 7 mA using a 1 mA meter movement.

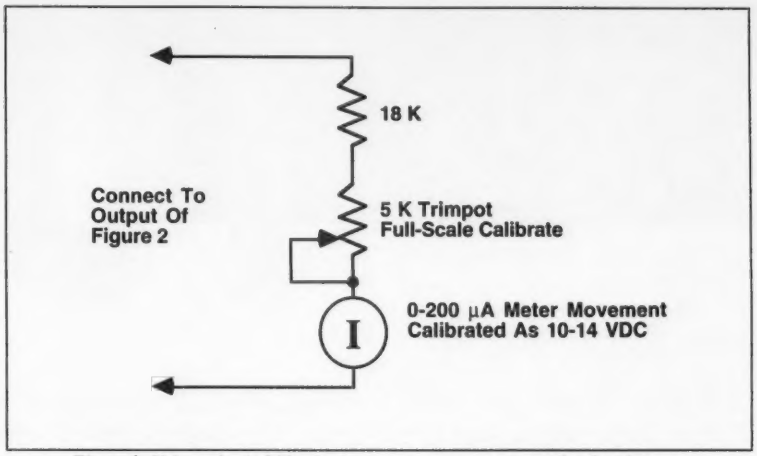

Figure 3. Using a basic 200 microamp meter movement as a 4-volt voltmeter.

Photo C shows another unit that was built with an ammeter included for monitoring either charging current or load current, as desired. Again, note that a fuse is installed.

Finding and Choosing a Meter

Finding a suitable meter shouldn't be hard or expensive. If the junk box doesn't yield a good candidate, a hamfest flea market surely will. Again, the easiest approach is to use a 0- to 5-volt DC voltmeter, as has been discussed. If you can't find one one of those, often you can modify another meter. For example, what if you have a 0-150 VDC meter (see Photo D). Useless, right? Nope; carefully take it apart and look for the series dropping resistor. Short it out and it is back to the basic milliamp or microamp meter movement. Then replace it with a new dropping resistor of proper size for 5-volt sensitivity (outside the meter, probably,

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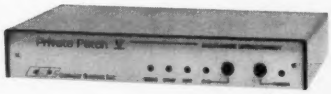

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Photo B. Rear view of a completed expanded-scale voltmeter. The circuit of Figure 2 is mounted on a perf-board which is attached to the meter terminals.

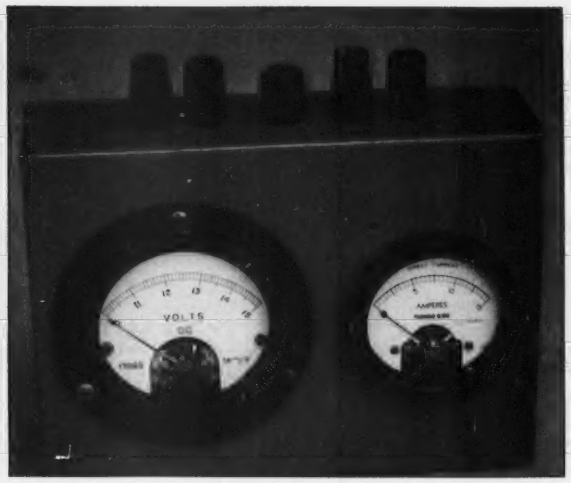

Photo C. Another example of an expanded-scale voltmeter. This unit includes a series ammeter to monitor charging current.

where it can be conveniently mounted on the perf-board). Often, either the meter's current sensitivity or its ohms-per-volt rating is stated in a lower corner of the meter scale; if not, calculate meter full-scale current sensitivity from full-scale voltage rating divided by series resistance. In a few cases the original resistor may be mounted outside the meter, on a board on its terminals; in some cases the resistor might be inside the meter but made harder to identify and access.

Keep in mind that the meter's scale will have to be renumbered; ideally, look for a meter with five major scale segments so that the 1-volt divisions will fall in place. Watch out for sealed meters that can't be opened, for non-linear-scale meters, or for AC meters. These are much harder, if not impossible, to modify. Look for meters that have scale divisions that would ideally divide each volt-spread into tenths.

A basic milliamp or microamp meter movement can also be used; a series resistor doesn't have to be removed in this case. Use a movement of not more than a few milliamps, though, or it will be a power-waster, and the dropping resistor may have to be high-power,

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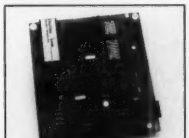

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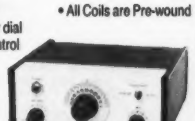

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too. For example, suppose you have a 200-microamp meter with only four scale segments. It could be modified to a 4-volt full-scale voltmeter with a series resistance of 20k ohm (series resistance is approximately the full-scale meter voltage desired divided by full-scale current sensitivity). Using the circuit shown in Figure 2, an expanded-scale display of 10 to 14 volts would result. If an 11- to 15-volt range is preferred, IC1 could be changed to a 7906, or IC2 readjusted for a 6-volt drop. The original scale divisions would be fine for the 4-volt range, and the original numbers and microamp label could be covered with white paint or gummed labels and the meter face then relabeled. Full-scale trim can be provided by making about 10 to 20 percent of the total dropping resistance variable with a trimpot; Figure 3 shows a possible meter circuit. If a high-voltage voltmeter is being modified to 4 or 5 volts full-scale, these same considerations apply, once the basic full-scale current sensitivity is found.

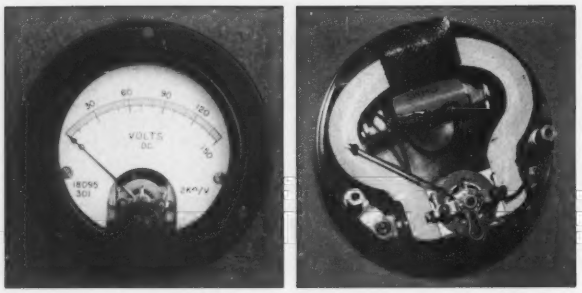

Photo D. Left: This high-voltage DC voltmeter can be modified for low-voltage expanded-scale use. Right: Internal view of the high-voltage meter. The dropping resistor is the large cylinder located in the middle of the horseshoe magnet. This resistor can be replaced with the proper value for low voltage use (see text).

The Voltmeter in Use

Once the expanded-scale voltmeter is built, what should be observed? For manual recharging when the battery is low, the expanded-scale voltmeter shows precisely when to begin recharging. With either an automatic charging system like WBØTCZ's, or with a float-charger, the expanded-scale voltmeter allows constant monitoring to assure that all is well. The terminal voltage of a fully-charged lead-acid storage battery in a constant state, being float-charged with a recharge current barely more than load current to allow for slight trickle charge, should be in the range of 13 to 13.8 volts, depending on temperature, battery design, age, etc. A battery hydrometer can be used to determine full charge, then the voltage checked and the float-charger set; my unit worked out at 13.3V. Under high-current recharge from a partly discharged state, terminal voltage can safely be higher, perhaps 14 to 14.4 volts or so for a few minutes to a few hours. During a deep discharge, the battery terminal voltage quickly drops to about 12.6 and then gradually decreases from there; recharging should begin, or operation ceased, if the terminal voltage drops below 10.5 to 11 volts. Readings outside these ranges indicate a problem that must be investigated.

When using a storage-battery setup, remember to take sensible precautions for ventilation and protection against acid spills, and use fuses and other precautions against short circuits. The water level should be periodically checked and adjusted as needed; float-charging causes a gradual loss of water, and if the lead plates become exposed to air the battery's lifetime will be shortened. The deep-discharge marine-type batteries are far more suitable for this service than are automobile batteries, and are worth the higher cost. Use of the expanded-scale meter, as discussed in this article, will help to maximize the lifetime of this expensive investment. 73

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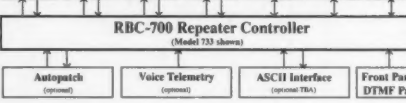

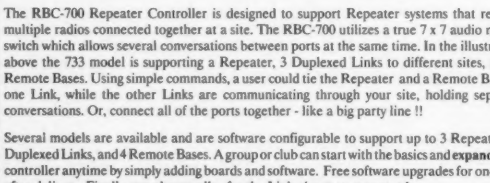

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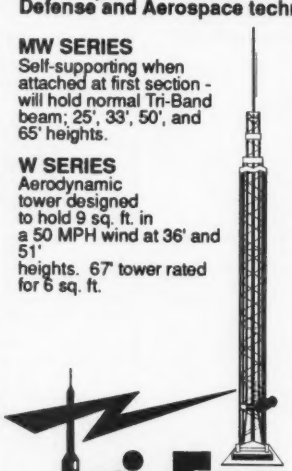

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DIGI-FIELD is $79.95. For more information, contact *I C Engineering, 16350 Ventura Blvd., Suite 125, Encino CA 91436; (818) 345-1692, (800) 343-5358, Fax: (818) 905-3374.* Or circle Reader Service No. 203.

ATV WORLD

ATV World has announced a new line of amateur television equipment. The flagship of their new offering is a unique dual-receiver ATV transceiver. This unit transmits in the 420 to 450 MHz band, and receives in the 1.2 GHz and 420 MHz bands. It includes four-channel transmit, video monitor of the detected RF, built-in transmit/receive change over relay, a dual-gate GaAsFET front end in the 420 to 450 MHz downconverter, 4.5 MHz audio subcarrier on transmit, power and TX indicators, and dual camera inputs. A spare set of audio/video RCA-type jacks are provided on the rear panel. The cabinet is manufactured of 0.60" heavy-gauge aluminum, silk-screened with a black matte-finish cover. Another unique feature is a choice of red or gray front and rear panel color.

The single-band transceiver can be ordered with the 450 MHz downconverter or with the 1.2 GHz downconverter installed. The single band unit may at a later time be upgraded to a dual-receive system with an upgrade kit. For prices and more information, contact *ATV World, 3713 W. Charleston Ave., Glendale AZ 85308; Technical Info: (602) 978-4348, Orders: (800) 424-2688.* Or circle Reader Service No. 201.

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The MK2 Microreader from Enterprise Radio Applications is a self-contained system for the reception and display of CW, RTTY, AMTOR, SITOR and NAVTEX on the HF bands. With the Microreader there is no need for computers, tapes or special leads associated with other systems. Just plug the Microreader into the headphone or speaker socket of your receiving equipment and you are ready to go. The Microreader was designed primarily to receive hand-set Morse; its ability to copy poorly-sent Morse under noisy band conditions is unique. It incorporates extensive filtering, carefully engineered to provide the right amount of processing for these real-life conditions. Decoding automated signals such as RTTY is easy in comparison.

The forward error correcting inherent in the SITOR and NAVTEX modes gives excellent performance, even under poor band conditions. Fully automatic detection, polarity sensing and lock-on makes operation on this mode simple.

The MK2 Microreader has been designed to work with almost any receiver, and also has an RS232 output port that allows decoded text to be sent to compatible printers, terminals or computers. Plus, it has a built-in Morse tutor. For the price and more information, contact *Enterprise Radio Applications, Unit 5, Clarendon Court, Winwick Court, Winwick Quay, Warrington WA2 8QP, England; Telephone: (0925) 573118, Fax: (0925) 231671.* Or circle Reader Service No. 202.

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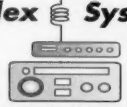

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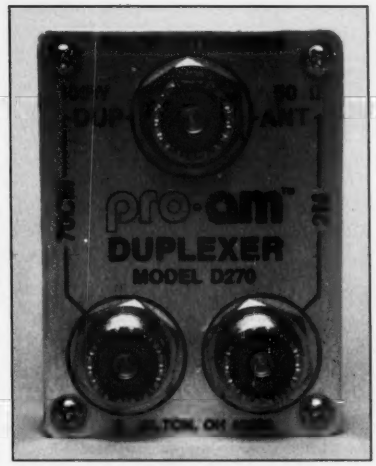
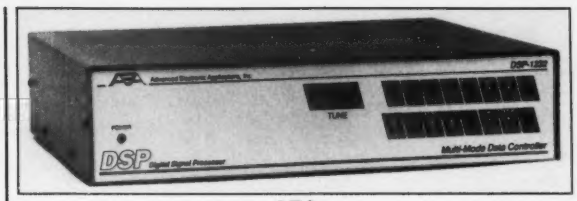


PRO•AM/VALOR

PRO•AM, a division of Valor Enterprises, has announced the new D270 duplexer for 2 meters and 70cm. This versatile item is used to connect a modern VHF/UHF dual-band antenna with a single feedline to separate 2m and 70cm transceivers or a dual-band transceiver without a built-in duplexer. It can also be used in reverse for connecting separate antennas to a 2m/70cm dual-band transceiver with only one RF output socket. The D270 is perfect for cross-band repeaters and/or remote base links, or it can be combined with a single 2m/70cm antenna to produce a dual-band mobile setup. It can also be used in the home station to connect separate 2m/70cm antennas to a dual-band transceiver or to connect a dual-band antenna to monoband 2m/70cm transceivers.

The suggested retail price for the D270 is $45.90, and it comes with a one-year warranty. For more information, contact *PRO•AM (a division of Valor Enterprises), 185 West Hamilton St., West Milton OH 45383; (513) 698-4194, (800) 543-2197, Fax: (513) 698-7273.* Or circle Reader Service No. 205.



AEA

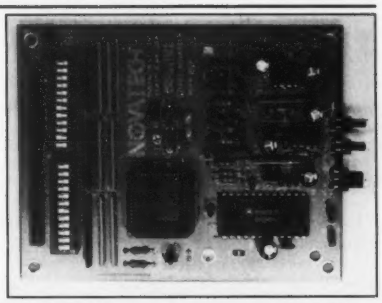
The DSP-1232 multimode data controller featuring digital signal processing is now available from AEA. A single-port version of the the DSP-2232, this controller features packet, AMTOR, Baudot, ASCII, Morse code, NAVTEX, WEFAX and more. It has all satellite digital modes, 9600 bps K9NG/G3RUH, 2400 bps, automatic identification of most types of digital signals, software DSP modems (future upgrades will be installed on EPROM chips) and software-switchable port selection. New modems can be uploaded into RAM from disk or telephone BBS. It also offers a complete 18K byte personal mailbox. This new controller eliminates the need for external modems for satellite work or high speed data.

The suggested list price is $799. For a product data sheet and a list of authorized dealers, contact *Advanced Electronic Applications, Inc., P.O. Box C2160, 2006 196th St. SW, Lynwood WA 98036; (206) 774-5554, (800) 432-8873.* Or circle Reader Service No. 204.

NOVATECH INSTRUMENTS

Novatech Instruments is now offering the DDS-3, a direct digital synthesizer kit that can be used to output signals up to 12 MHz with excellent spectral purity. The DDS-3 can be programmed to output sine and TTL/CMOS signals from 2 Hz to 12 MHz in 2 Hz steps. The output frequency is determined by setting a 23-bit binary word using either a DIP switch or a parallel ribbon cable input. The output amplitude is 1.4 Vpp into an open circuit. The user can obtain fast switching of the output frequencies since the transition time for changing frequencies is less than 250 ns. Spectral purity is better than -90 dBc phase noise at 1 kHz offset, -45 dBc spurious and -40 dBc harmonic. Stability is better than 10 ppm.

The DDS-3 is priced at $119.95 plus $5 S & H (WA residents add 8.2% sales tax). For more information, contact *Novatech Instruments, Inc., 1530 Eastlake Ave. E., Suite 303, Seattle WA 98102; (206) 328-6902.* Or circle Reader Service No. 206.



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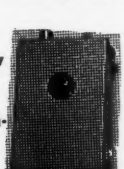

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The AMSAT Annual Meeting

The 1992 AMSAT Annual Meeting and Space Symposium was held October 9-11 at Intelsat Headquarters in Washington, DC. Hundreds of satellite enthusiasts from around the world listened to the presentation of over two dozen papers, examined satellite models on display, watched as exotic devices were demonstrated and made contacts from a completely operational satellite station. For all participants, it was a great weekend.

Friday

The AMSAT activities in Washington began at high noon Friday, October 9th. Two concurrent seminar sessions were held that afternoon. One was the AMSAT and ARRL Education Workshop. Several topics were covered, all with the common theme of satellites in education.

The parallel program started with a presentation by Doug Loughmiller KO5I and Mr. Kim of the Korean Advanced Institute of Technology on the progress of KITSAT-A, now known as Kitsat-OSCAR-23. Bob Bruninga WB4APR discussed packet radio experiments via satellite and HF at the U.S. Naval Academy. He presented details on a location system using a GPS (Global Positioning System) satellite receiver coupled with a laptop, AX.25 TNC (Terminal Node Controller) and radio. These systems determine the position and course of a vehicle and broadcast the data using automatic "BTEXT" packet transmissions. A suitably equipped base station receives the transmissions and updates its database. Bob displayed a basic receive station at the symposium.

AMSAT Director Tom Clark W3IWI provided explanations of the recent changes to AMSAT's internal communications system on the Internet. A computer system in Southern California is responsible for processing and distributing AMSAT bulletins to packet networks, other Internet addresses and CompuServe. Recent upgrades for more efficient operation were outlined along with proposals for future enhancements.

Kent Darzi KD4MKD and Dennis Wingo KD4ETA updated the audience on the status of SEDSAT-1. This is a microsat-class satellite that will be flying as a secondary payload as part of NASA's Small Expendable Deployer System (SEDS). SEDSAT 1 will be placed in a circular orbit with a mean altitude of 730 km at 39 degrees inclination. Several amateur radio systems for analog and digital communications will be included with an array of scientific experiments to study orbital mechanics, the dynamics of tethered satellites and remote sensing.

AMSAT Director Joe Kasser W3/G3ZCZ provided an update on the French ARSENE project with information from Bernard Pidoux F6BVP. The ARSENE satellite will carry a Mode S (70 cm up and 13 cm down) analog (voice) transponder and a mode B (70 cm up and 2 meters down) AX.25 BBS running 1200 BPS AFSK. No special modems will be required to work the satellite's BBS, just a standard TNC. The satellite will have a slightly elliptical orbit around the equator with an altitude ranging between 20,000 and 36,000 km. Each orbit will take 16 hours.

Other Friday talks included a satellite gateway discussion by John Hanson WAØPTV, efforts on the AMSAT deep space exploration antenna project in Colorado by Jim White WDØE and a discussion of recent balloon experiments by our own *73* editor Bill Brown WB8ELK.

Saturday

Saturday morning started with a welcoming from AMSAT Director and President Bill Tynan W3XO. He was followed by Jim White WDØE and his description of microsat engineering test results. Bob Diersing N5AHD continued with information on microsat downlink error rates and file server operation. Before the day's first break, AMSAT-UK Secretary Ron Broadbent G3AAJ discussed the European perspective on worldwide amateur radio satellite efforts. The remainder of the morning sessions and some of those in the early afternoon were dedicated to the Phase 3 D program. AMSAT Director Dick Daniels W4PUJ moderated the pre-lunch talks while providing his own input on the system overview. Phase 3 D is an extremely ambitious international project to provide a satellite covering ham bands from 10 meters to 10 GHz. Signal levels from the spacecraft are planned for levels 10 times stronger than AMSAT-OSCAR-13. Receive capabilities are similar.

Dick Jansson WD4FAB provided details of the spacecraft structure and antenna efforts. Jack Colson W3TMZ described further endeavors with antenna designs, including patch antennas, short helix arrays and "backfire" systems. When complete, Phase 3 D will bristle with antennas.

Bob Twiggs of Weber State University presented data on the student construction of the spaceframe. The structure will weigh nearly 1100 pounds and have a solar panel and main body span of over 23 feet.

Tom Clark completed the Phase 3 D sessions by reporting on the results of his GPS receiver experiments. In addition to accurately determining location, the GPS units can be used to establish spacecraft orientation and locking onboard frequency standards.

David Liberman XE1TU brought the group up-to-date on the status of UNAMSAT-1. This microsat, built at the Autonomous University of Mexico, is scheduled for a December 1992 launch on a converted Russian ICBM. In addition to a 1200 bps store-and-forward system similar to current microsats, this unit carries a 40 MHz meteor radar. The satellite uses DSP techniques to analyze echoes from meteor trails. The information is relayed to the ground using AX.25 packet telemetry transmissions. Dave described the effort in Mexico to finish the satellite and complete final testing.

Lou McFadin W5DID and Frank Bauer KA3HDO presented information on SAREX, the Shuttle Amateur Radio Experiment. Recent activities have been very successful and as many as five shuttle flights may carry SAREX equipment in 1993. One of these amateur radio missions is scheduled to have Sergei Krikalev U5MIR on board.

Other Saturday talks included an operations report from AMSAT Vice President of Operations Keith Pugh W5IU and a description of the AMSAT

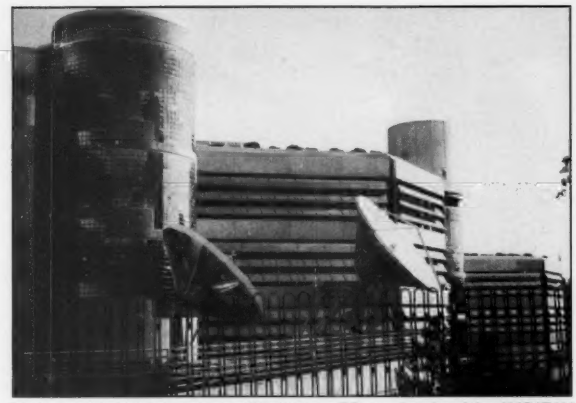

Photo A. Intelsat Headquarters in Washington, DC was the site of the AMSAT-NA 1992 Space Symposium and General Meeting.

Photo B. The Intelsat control room for satellite control operations was part of a tour offered during the symposium.

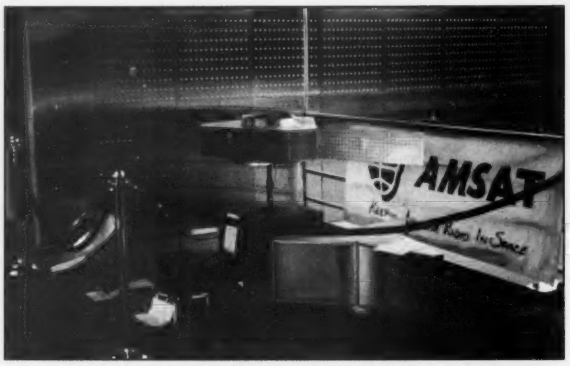

Photo C. A Mode S receive system, a microsat engineering model, a Phase 3 spaceframe and a Phase 3 D scale model shared display space at the symposium.

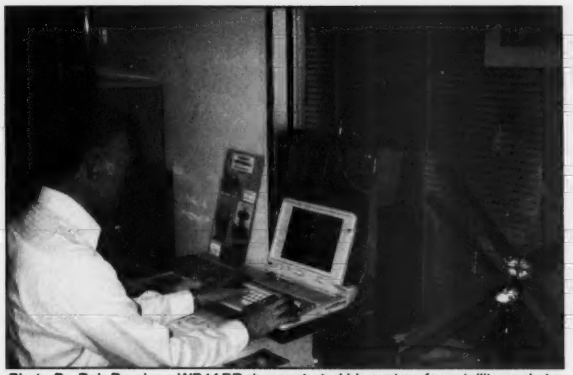

Photo D. Bob Bruninga WB4APR demonstrated his system for satellite packet radio and auto-location experiments.

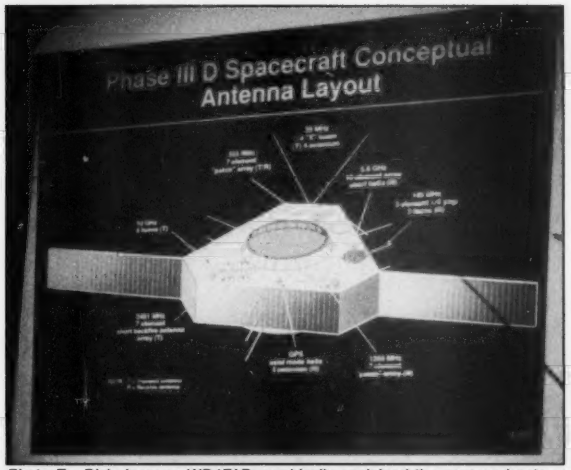

Photo E. Dick Jansson WD4FAB graphically explained the proposed antenna system for Phase 3 D.

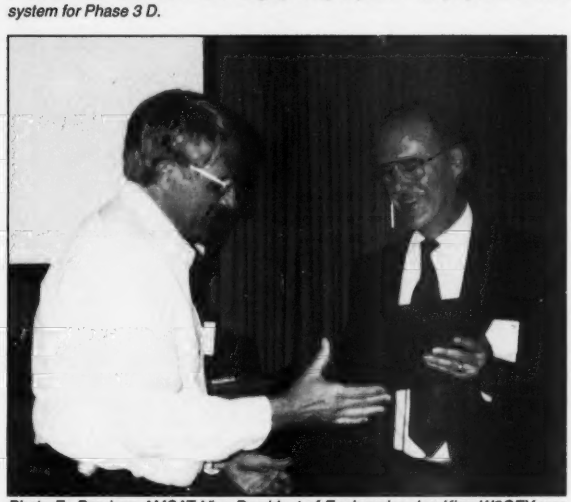

Photo F. Previous AMSAT Vice President of Engineering Jan King W3GEY was recognized by AMSAT for his years of service since the creation of the organization in 1969.

Awards Program by AMSAT Director Andy MacAllister WA5ZIB.

The day finished with the AMSAT Annual Meeting, a buffet dinner, awards presentations, prize drawings and an inspirational talk from Astronaut Ron Parise WA4SIR. Ron took time out from a Cub Scout camping trip to show some shuttle video and discuss his radio activities from space.

Sunday

Sunday began with a beginners' forum hosted by AMSAT Vice President of Field Operations Mike Crisler N4IFD. Stephan Greene KA1LM followed with information on how to put together an effective movable antenna system for A-O-13. He made his point by bringing the array into the Intelsat building on a wheeled cart. Eric Rosenberg WD3Q provided some tips on DX via satellite. Eric has been both a DXer and rare DX and will be going overseas again soon with satellite-ready radio equipment. Ed Krome KA9LNV was the last speaker of the symposium. He described his low-cost Mode-S equipment for OSCAR 13 operation. Mode S uses a 70 cm uplink coupled with a 2.4 GHz downlink. Although this combination may seem difficult to use, Ed's results have been exceptional. He has tried different antennas for his experiments to a downconverter from Down East Microwave and a 2 meter multimode receiver.

A tour of the Goddard Space Flight Center followed for those who did not wish to attend the Board of Directors' meeting. Most participants took off for home late Sunday while those attending the Board meeting went to the AMSAT offices in Silver Spring, Maryland on Monday for continued discussions.

Symposium Committee Chairmen Ken Nichols KD3VK and Steve Todd K2IYQ worked with AMSAT-NA Secretary Martha Saragovitz and the rest of the crew to do a fantastic job of preparing and running the weekend events. Walt Daniel N3KVQ kept all the talks on schedule and made sure the timetable went smoothly. Next year's symposium will either be held in Texas or Florida.

Photo G. Astronaut Ron Parise WA4SIR was the guest speaker at the AMSAT Saturday night banquet.

Copies of the Proceedings of the AMSAT-NA 10th Space Symposium are available from AMSAT or the ARRL. The book is 8 1/2" by 11", 300 pages long and softbound. It's well worth the cover price of $12.00. AMSAT can be contacted at 1-213-589-6062 for details on shipping charges. 73

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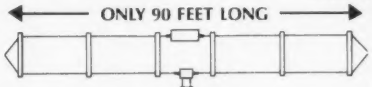

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HOMING IN

Radio Direction Finding

Joe Moell, P.E., KØOV
P.O. Box 2508
Fullerton CA 92633

Crowning the Champs

Baseball has the World Series. Football has the Super Bowl. Most sports have a national championship to determine which team is the best of the best. In ham radio, Field Day is the biggest annual club QSO competition. But hidden transmitter hunters (called foxhunters or T-hunters) hold their mobile radio direction finding (RDF) contests only on a local basis.

Is it time to start thinking about regional foxhunting tournaments, or perhaps national championship matches?

I think plenty of RDFers would be interested. Southern California hunters claim that there are no tougher hunts, and no better T-hunters, anywhere in the world. (No one ever called them humble.) I'm sure that their counterparts in other parts of the country feel they are just as good.

"Is it time to start thinking about regional foxhunting tournaments, or perhaps national championship matches?"

Hams in Great Britain test their mobile foxhunting abilities with a tournament each year. There are qualifying rounds in various cities, followed by the National Final Championship in September.

Countrywide championships are practical in Britain because the nation is small and a standardized set of rules has been developed over the years. In the USA, it's completely different. Our country is so big and its geography is so diverse that regional hunting practices vary widely.

For example, most Los Angeles area hunt boundaries are large and include both urban and high mountain terrain. The 6's love weak fox signals. They don't mind installing long beams or quads on their vehicles and using low-noise preamps. Lengthy all-day and all-night hunts are well attended. Lowest odometer mileage determines the winner.

A few hundred miles away in Phoenix, T-hunters want the game to go much faster. They favor Doppler type RDF sets, which require much higher signal levels from the fox. The first team to find the T wins.

There are no mountains to bounce VHF signals in Nebraska, so hiders there add difficulty to the hunt by making short transmissions, with long periods of no signal in between. And so it goes.

How shall we develop a set of rules for championship hunts that are acceptable to RDFers in those three places and everywhere else in the USA?

How do we satisfy both the low-mileage-wins and first-finder-wins camps at the championships? Must we have separate categories? A combination of time and mileage is probably unacceptable to both. Let's hear your thoughts.

Hunting for Dollars

ARRL conventions host the only area-wide T-hunt competitions in the USA right now. A worldclass mobile hunt has been a feature of every Southwestern Division convention for many years, complete with prizes for the winners. Hams from all over Southern California and Arizona are invited.

When the ARRL National Convention came to Los Angeles this year, the Fullerton Radio Club (FRC) was selected to put on the convention hunt. The convention committee told FRC to invite everyone and pull out all the stops. The hunt had to be challenging, but fun.

FRC designed the hunt to test the abilities of 2 meter DFers both in and out of their cars. The hunt committee settled on a three-segment contest, with prizes for first, second, and third in the overall scoring, plus a prize for the winner of each segment.

The first requirement for the 22 participating teams was to find a station that was 13 miles south of the convention hotel in a park. Transmitter power changed every second, varying from 15 watts to a few milliwatts. Hunters with beams and S-meters had to keep one hand on the mast and the other on the attenuator switches.

Segment number two was an on-foot "sniffer" hunt in the same park, with some unusual twists. Contestants were told that their point score would equal the number of minutes it took the team to identify the numbered tag on the fox, and that the team with the shortest time would win the hunt.

They were warned that there would be decoy transmitters and antennas nearby. Every time a team member reported a wrong tag number, the team would be given a 10-point penalty. This forced the hunters to carefully use their equipment as well as their eyes.

Their RDF sets showed lots of RF coming from a kiddie play fort in the park (Photo A). In addition to the real 20 milliwatt T, there were two half-watt decoys, plus an audio decoy and a non-transmitting mag-mount. Selective switched-antenna RDF sets worked best, but gave confusing indications at times (Photo B). The mag-mount (Photo C) was incorrectly guessed many times, resulting in lots of penalties and much running back and forth to the check-in station.

Photo A. (Left to right) Course Marshall Gary Holoubek WB6GCT watches as Deryl Crawford N6AIN, Tom Mirabella KD6AAN and Tom's father, Ken KM6YH, swarm around a kiddie fort in the park. They know they're close to the second hidden transmitter at the 1992 ARRL National Convention T-hunt.

Photo B. What strange indications! Eric Nansen N6YKE (foreground) and Richard Heryford WD6ESZ are momentarily mystified by the real and decoy signals. The hidden T is in the center of the picture, concealed under the base of the ramp. You can't see the tag, because it's in the shadow.

Most teams eventually found the real bunny under the ramp to the kiddie fort. Only its tag was visible (Photo D). But no one identified the antenna. Some thought the T was connected to a dummy load. Actually, the antenna terminal was wired to the entire chain-link handrail on one side (Photo E). The end of the chain was only a few inches from the decoy mag-mount.

Clarke Harris WB6ADC was captain of the team that won this part of the hunt. His sniffing crew (Gary Crist KI6FG, Ken Stroud AB4RQ, and Gary's sons Mike KC6DCR and Brian) ferreted out the right signal source in a little over 10 minutes, with no penalties. That was so good that the WB6ADC team ended up taking first place overall, even though they were not winners in the other two hunt segments. Other scores on the sniffer hunt ranged from 17 to 96 points.

From the high elevation of the park, most teams could hear transmitter #3, which was 44 miles away in the Ange-

les National Forest, running five watts. The beam was pointed at a nearby mountain, in hopes of giving misleading bearings.

No Wimps Allowed

From an international standpoint, our mobile T-hunts are the exception, not the rule. Only in Britain, Japan, and North America will you find regular opportunities to hunt in your car. Everywhere else, it's all done on foot and the participants consider themselves to be amateur athletes. There are no big-dollar prizes to be won, but plenty of fame, glory, and nice medals.

This form of radiosport is most popular in eastern European countries, where it is a part of physical education in the schools. It's also active and well organized in Scandinavian countries, and in Japan and China. National on-foot foxhunt championships take place annually. The International Amateur Radio Union Region 1 Championships provide inter-country competitions every two years.

Stateside hams got involved in European/Asian style foxhunting for the first time in 1989, when the first Friendship Radiosport Games (FRG-89) were held in Khabarovsk, a city in Asiatic Russia. Five hams from Portland, Oregon, traveled to Khabarovsk for a foxhunt, a CW contest, and an HF QSO contest.

The Games grew out of a Sister Cities International exchange program. The hams of both countries had so much fun that they formed the Friendship Amateur Radio Society (FARS). One goal of FARS was to put on the Games every two years.

Portland hams reciprocated by holding FRG-91 in their city. (See "Homing In" for September 1991 and "Showdown in Portland" in the November 1991 issue of *73 Amateur Radio Today*.) This was the first internationally sanctioned foxhunt competition on US soil. It drew entrants from the USA, Japan, and Russia.

As good-byes were exchanged in Portland, every participant was eager to begin planning the next Friendship Games. Where shall we meet in 1993?

Just after the 1991 Games, Evgeny Stavicky UWØCA, Chairman of FARS-Khabarovsk, sent an open letter to the hams of Victoria, British Columbia, another sister City of Khabarovsk. He told them that they had much to gain by becoming involved in the activities of FARS.

The hams of Victoria jumped at the chance. They met with FARS-Portland leaders and set up on-air contacts with the Russians. When UWØCA came to Oregon for a convention in June of this year, the planning for FRG-93 began in earnest.

Perry Creighton VE7WWP picks up the story: "After meeting the Russians in Seaside, we brought UWØCA and two others to Victoria and spent three days with them. We agreed that we would host the 1993 games up here, and extended an invitation to 14 of the Khabarovsk hams to come over.

"While the Russians were in Victoria, we were very fortunate to get them involved with Camosun College. The college agreed to co-sponsor the Games and provide logistical support." FARS-Victoria was formed, with Martin Dunsmuir VE7BDF as president. Martin is the electronics instructor at Camosun College.

The Games are now scheduled for June 24 to 27, 1993, which happens to coincide with Field Day weekend. FARS-Victoria Vice-President VE7WWP says, "Our intent is to run a special events station, a Field Day station, and the Games all at the same time. We want to have a hamfest with a flea market and commercial exhibits, too."

When I asked if Field Day activities would detract from the Games, Perry told me, "Field Day is not that big a thing in this part of the world. We have a thousand hams in the greater Victoria area, but we have been able to round up maybe 25 people at best for Field Day in the past.

"If all other things could work out," he added, "we would throw it a week later, which would be over the July 1st Canada Day weekend. But internally we have a lot of problems with availability of people who can do the various things that we need to have done at that time."

Besides participants from the USA, Canada, and Russia, hams from around the world are invited to take part in the Games. Japanese foxhunters scored well at FRG-91, and will be invited back. VE7WWP says, "The more the merrier. The college wants us to bring people in from around the world. The Russians will be transported and housed by local hams. We will do our best to arrange billeting for others, depending on the response we get."

Start Planning Now

So here is your chance to participate in an international foxhunt competition. Many of the Russians will be bringing their families, so be sure to include yours. You won't need overseas plane tickets, because Victoria is only 75 miles by ferry boat from Seattle.

It's a beautiful British city where you can find both cricket matches and totem poles. Plan some extra time for Victoria's traditional high tea at the Empress Hotel and a visit to Butchart Gardens. Find out what a "rockery" is.

For more information, or to register for FRG-93, write to FARS-Victoria, c/o Camosun College, Box 128, 3100 Foul Bay Road, Victoria, British Columbia V8P 5J2. Remember that the letter rate for mail from the US to Canada is 40 cents per ounce.

Membership in FARS-Victoria is open to anyone, ham or non-ham. So even if you can't participate in the Games, you can join this non-profit organization and support the program. Write for a membership form. 73

Photo C. Many hunters, including Jerry Hughes KC6YMP, were certain that this tagged horizontal mag-mount antenna belonged to the hidden T. But its coax was not hooked up. The actual emitter was the chain, just inches away.

Photo D. No, it's not a bird's nest in this flash photo. You can barely see the tag on the real 20 milliwatt hidden transmitter concealed under the ramp.

Photo E. Several hunters walked right over this antenna connection. A corroded piece of wire ties the transmitter under the ramp to the chain/antenna. Can you see it?

PACKET & COMPUTERS

Jeff Sloman N1EWO
5937 Carvel Avenue
Indianapolis IN 46220

Good News About the Internet

My request for help in locating an Internet-to-AX.25 gateway certainly caused some activity. I received several Internet mail messages with information about the NØARY gateway/(P)BBS in Sunnyvale, California—and it is good news indeed. Those of you who are looking for a way to get packet messages to and from the Internet will find what you need, plus an unexpected bonus.

Bob Arasmith NØARY wrote the code that drives the BBS and gateway, which runs on a Sun SPARCstation under UNIX. He says, "It started out to be a PBBS, because I was disappointed with the network—rather than user—orientation of the popular PBBSs, I tried to include lots of user friendly features I didn't find on the other systems." Borrowing from his UNIX experience, Bob included user profiles in his code. This allows each user to customize the way the BBS behaves when they connect. Message list order and lines per screen are a couple of examples of user-settable parameters. But it grew from there. Bob added AX.25 to Internet mail forwarding capabilities. That's right, registered users can use NØARY as their home BBS, and have the SPARCstation forward packet messages they receive there to any valid Internet address, even CompuServe.

Pretty impressive, but his user orientation wouldn't let Bob stop there. "The Internet mail capability was fine, but it didn't let users choose `reply' to answer packet-originated messages they had received; I had to add the gateway in the other direction," Bob told me. So now BBS users can send and receive packet messages from their Internet mail accounts. Users of CompuServe, MCI Mail, or another service that has an Internet mail connection can use NØARY to work all of their packet traffic, without ever keying a radio. The BBS has about 700 users, and a large portion of these never actually connect to it.

You say you don't have an Internet mail account, and you don't live in Sunnyvale, but you sure like the sound of the NØARY machine? Well, don't worry, Bob hasn't left you out. You can reach the NØARY BBS by telephone modem. In addition to the two TNC user ports, NØARY supports a dial-up connection that behaves exactly like a local TNC connect. You can reach the BBS at (408) 749-1950. When you connect, you'll see the prompt:

NØARY/BBS (type bbs) login:

Do what it says: Type "bbs" at the prompt. The BBS will prompt you for your call, and then look it up on a CD-ROM-based *Callbook* database and prompt for confirmation of the information. NØARY also maintains a local copy of the *White Pages* database, and will probably know your current home BBS. Once through the login process, the BBS treats you just like one of the "local" users connected by radio. If you happen to be line-of-sight to Sunnyvale, you might try connecting on one of the two TNC user ports—144.930 in the 2 meter band and 433.370 in the 70 cm band.

Two Types of Access

NØARY supports two types of user access. Local users are those who connect directly, whether by radio or by land line. The use profile maintained by the BBS keeps track of the user's preferences, including several "macros" that can be used to automatically list new messages when connecting—or almost anything else that can be done from the keyboard. The second user type is "remote," users who access the BBS via Internet mail. Remote users can send and receive messages from their Internet mail account, but there are two things that must be done first: registration and enabling email forwarding.

Registration and Enabling

Registration is simple. From the host you want to use, send a message to:

gateway-request@arasmith.com

The text of the message needs to include:

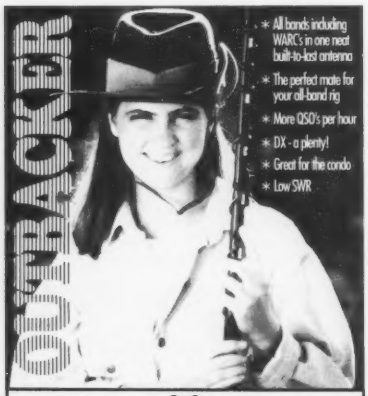
CALL: *(your call@your home BBS)*
FIRST NAME: *(your first name)*
CITY & ST: *(your city and state)*
ZIP: *(your zip)*

Note: If you omit a specific home BBS on the call line, you will be assigned NØARY as a home BBS. If you do supply a home BBS, make sure people who want to send you mail that ends up on the Internet address it to:

your call@NØARY
(e.g.:N1EWO@NØARY)

That's all there is to it. NØARY then adds the information from the message's "from" field and the call in the body in its registered user list. From then on the BBS will use that call when an Internet message—bound for packet—comes from that host and user. If the host and user are not registered, the message is "bounced"—returning it to the user with a one-line message indicating that registration is required.

The second step is to enable email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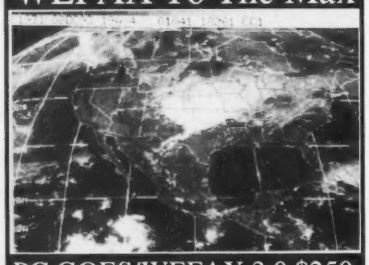

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forwarding. Do this in one of two ways. The first is by connecting as a local user and issuing two commands:

email (your Internet address)

and

email on

NØARY will respond to the last command with:

Automatic EMAIL forwarding is ON

. . . and you are done. Beware that if you enable forwarding, the BBS will delete each message as it is sent on to the Internet address you specify, so be sure you have it right or you risk losing some mail.

The second method is to send the same commands as an Internet message to:

cmd@bbs.arasmith.com

You can now send and receive packet messages via the Internet mail system. Pretty neat, huh?

Sending and Receiving Messages

To send a message from the Internet to packet just send it to:

(call)@bbs.arasmith.com

or, if the user might not be known by NØARY (pretty unlikely, but . . .):

(call)%(BBS)@bbs.arasmith.com

To send mail in the other direction (that is, AX.25 to the Internet), send the message to:

IPGATE@NØARY

and, on the first line:

To: (Internet address)

The subject line can be anything you want. You can send the message from any PBBS, or from the dial-up connection to NØARY.

Additional Features

There are more features on the NØARY BBS than I can possibly describe here—the current user's manual is more than 130 pages long—so I'll just go over some highlights.

First of all, NØARY is a UNIX-based system and supports some commands that will be familiar to experienced UNIX users. For example, the file system—which contains text files of interest to hams—is accessed with the familiar CD (Change Directory) and DIR or LS (list directory).

Users familiar with WØRLI PBBS software will find that many of the standard commands work just as expected—the List command, for example. There is a help file available that lists translations of WØRLI commands. You can access it with the command:

INFO WØRLI

Keep in mind that this can be done via the Internet with the same method described for remote forwarding enabling (see above). The fact is, pretty much any command that does not require interaction can be done via the Internet, with the result coming by return mail.

Signature:

NØARY can store a "signature" for each local user, which it will attach to each message sent.

Vacation:

When you set vacation mode, NØARY will reply to messages sent to you with a "canned" message you compose. This lets the sender know that you will not be able to answer for a while. The BBS also holds the message for longer than it would otherwise.

Voice:

If you are lucky enough to be in the Sunnyvale area, you will be able to check for mail by using a 440 radio. The voice synthesizer will tell you the status of your mail account.

Keystroke Macros:

Local users—via phone or radio—can store keystroke macros that allow frequently used keystroke combinations to be accessed with a single key. These are personal, and part of the user's account.

After reading this, I'll bet you share my enthusiasm. When I asked Bob if he could handle a bunch of new users, he said "bring 'em on." When you get on, be sure to let Bob know that you appreciate all of his hard work setting up and running the BBS. So go ahead and use it—by phone, radio, or the Internet and have lots of fun. I have, so far.

"There are more features on the NØARY BBS than I can possibly describe here—the current user's manual is more than 130 pages long—so I'll just go over some highlights."

Mail

I've received quite a bit of mail, but I don't have the space this month to respond to it. I will next month, though—there's some good stuff. Thanks for writing to me; I appreciate every letter—in agreement or not.

Where to Reach Me

I just want to repeat the electronic addresses where you can contact me. The preferred address is jsloman @mcimail.com on the Internet. My packet address is N1EWO@ NØARY.#NOCAL.CA.USA.NA, and least desirable is CompuServe at 71221,1143. Remember, if you want to talk to me about the column, with a question or suggestion, don't use the packet address. Instead, use the Internet or CompuServe. Feel free, though, to use any of the addresses to test your packet station—I am happy to help.

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Filters for 2 Meters

This month I would like to finish up covering filters by offering details for a few different designs for a 2 meter filter. This filter is used to help prevent RF desensitization or RF saturation on your HT or similar transceivers when they operate near commercial high power VHF radio facilities. The design details that I will present are another attempt to construct simple filters out of readily available component parts for home construction. The construction of filters, and for that matter almost any electronic project, can be quite intimidating if you do not have a well-stocked junk box. Most of us, myself included, have spent many hours trying to come up with components to construct a seemingly simple project, only to put it on hold for lack of materials.

Here are a few designs for 2 meters that should be easy to construct. What makes these filters nice is that they can be constructed out of components from your plumbing or hardware store, or even your own kitchen. I have provided several basic designs to simplify the filter's construction. They can be adapted to your HTs as well as mobile rigs to reduce or eliminate desensitization when operating near commercial installations.

2 Meter Filters for HTs

The first filter was actually constructed for a low power 2 meter HT (5 watts) that could be used with a rubber ducky or conventional antenna. It can be used in line with a mobile transceiver but was built to be small and therefore is more suitable for low power HTs. In either case, the filter is used to provide attenuation higher in frequency where the offending signals lie. Operation without this type of filter near high power transmitters could shut off (or bias, active AGC, etc.) the front end RF stage of your receiver. If this is the case, your receiver will be dead when mountaintopping or contesting near high power VHF RF.

For example, during the ARRL 10 GHz microwave contest this year, filters of this type made the difference in being able to communicate from some of the more populated RF microwave mountaintop sites. The filter provides attenuation to signals above 150 MHz and very low loss to signals in the 144 to 148 MHz 2 meter band. This provides the needed filtering and attenuation to make operation quite manageable near high power RF sources. Most newer VHF radios do not have adequate filtering to prevent this type of out-of-band influence.

This first filter, constructed by N6IZW, uses two large ceramic adjustable coil forms half an inch in diameter and about two inches long. A coil is wound on each form with #12 enamel wire, almost filling the entire coil length with about 12 turns. Leave some room for pruning and varying the turn spacing on the form. Initially, the coil is wound tightly and then can be spread out to resonate as needed. The adjustable core makes this much easier. Each coil is taped at exactly one turn above ground, the 50-ohm point of connection. The two coils are positioned half an inch apart adjacent to each other, within a metal box approximately 2-3/4" x 2-1/8" x 1-1/4" (the box size isn't critical). BNC coaxial connectors serve as input/output connections to the taps on each coil on our model, but you can use any connector you desire.

You need some means of injecting a signal through the two coils to determine just where resonance is, pruning, stretching or adjusting the slug-tuned coil form until minimum SWR or resonance is found. One method of adjustment is to couple a low power HT through the filter with an SWR meter coupled to a power meter and adjust for minimum SWR. Loss through the coils runs about 1 dB at 2 meters. Then check where the coil rolls off—it should start to give higher attenuation near 150 MHz and increase rapidly as frequency is increased. This coil and adjustable slug will not take a large amount of power, so limit it to less than 20 watts. Different designs and construction techniques are required for higher power. See Figure 1 for design details.

A variation of the slug-tuned coil design developed by N6IZW is to wind the coils out of #12 wire on a 5/8-inch mandrel and mount them without the coil form. The coils are positioned much the same as with the form but are now suspended in air and rigidly grounded at the bottom of the coil. Adjustment is more critical as we do not have any adjustable core to help in tuning. The coils must be adjusted entirely by stretching and adding or removing turns to bring them to resonance. Note: The metal chassis is the same size as the coil form version.

The coils are placed adjacent to each other, spaced the same half inch apart, and are resonated by the proximity to the metal case and tight coil-to-coil turn spacing and length of each coil. The RF input and output is placed at the one-turn point from the grounded end of each coil. Make this connection as direct as possible to the solder pin on the BNC connector. Excess length at this point will increase loss and reduce efficiency of the filter. See Figure 2 for design details of the air-spaced coil filter.

If your coil section does not resonate at the desired frequency you might have to add a turn or two; however, we have found in our container that 12 turns seems about right. The test results for this filter are as follows: 1 dB insertion loss; 10 dB rolloff frequencies at 119 MHz and 154 MHz. The 20 dB rolloff points are at 110 MHz and 164 MHz. The filter exhibits 1 dB ripple between 130 and 144 MHz. See Figure 6 for the frequency response curve of this filter.

Make sure that your coil structure does not touch the side of its cabinet (chassis) because it may present a problem to your transceiver. This filter can handle quite a good power level (it has been tested to 45 watts in mobile applications). I attribute this to removing the adjustable coil or air variable capacitor found in other designs.

Alternate Designs for 2 Meters

Alternate designs at moderate power levels can be accommodated by small air-variable capacitors and compact coil circuits that are contained in the same metallic enclosure. This enclosure can be as simple as one constructed out of PC board material, or even some suitably-sized chassis or box. When using PC board material be sure to use the double-sided variety. Ground both sides together at several places. I constructed one for 2 meters and had some very funny things happen because one side of the copper foil was not grounded. It gave some weird results—just ground the two sides together for minimum problems.

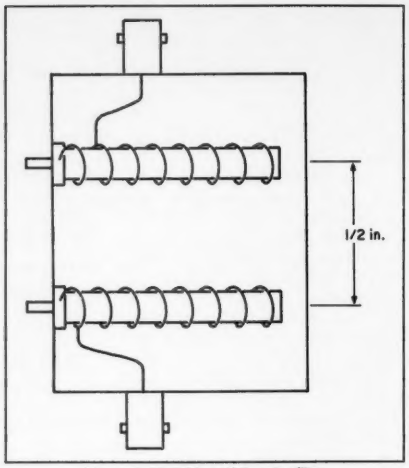

Figure 1. Variable coil 2 meter filter.

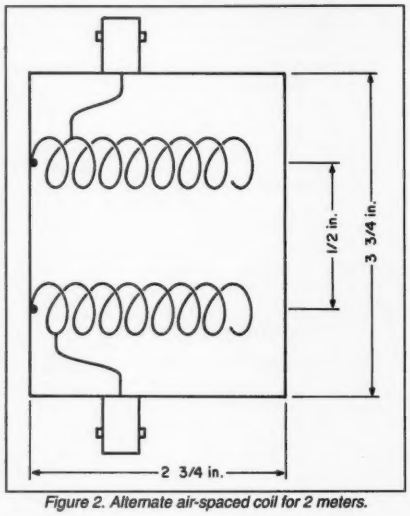

Figure 2. Alternate air-spaced coil for 2 meters.

Another filter circuit for 2 meters using air variables can be contained in a box slightly larger than 2" x 4" x 1-1/2". The small size is due to bulk coil and small air variable capacitors in the 10 pF region to resonate the circuit. The ground end of the coil is a straight section of wire about an inch long with an 8- to 10-turn coil (half-inch diameter, spaced one wire turn, #12 wire) to bring the circuit to resonance with the trimmer. Tap the straight section at about the 3/4 to one inch above ground for impedance matching. Mount the coaxial connectors near the tap above ground on both coils. The taps are adjusted for proper match on the straight portion of the coil above the ground end of the coil. See Figure 3 for air space coil construction.

Proper position of the coil taps can be determined by operating the filter in the receive mode and adjusting for best receive performance on both input and output taps. Since you can verify filter operation in this manner, and because of the air variable capacitors, this filter can be used on other nearby frequencies, either higher or lower. This eliminates the need for the test equipment normally required to align the circuit (allowing operation with a scanner, for instance). After this basic alignment, check it out with an SWR meter for final settings.

Normally for 2 meter use we measured 10 dB attenuation at 150 MHz, and at 152 MHz it ran near 20 dB loss. The purpose of the straight portion of the coil circuit near the ground end is to remove the lumped coil circuitry and provide a portion of transmission line length for a short section to facilitate matching and allow room for the coaxial connectors for short connections.

The coil with a section of transmission line attached is similar in construction to a limited-space antenna—for instance, if you constructed a dipole "slinky" antenna by distributing the coil of the slinky out in each direction for the desired dipole length. This type of antenna, constructed entirely out of a coil for its entire length, would not give good performance. Now, if you spread out a few turns of the slinky coil (end section), producing a near straight section on each end of the dipole, the "slinky" antenna will now show better resonances and vastly improved operations vs. a bulk coil design. This is a limited-space antenna; the filter is a limited

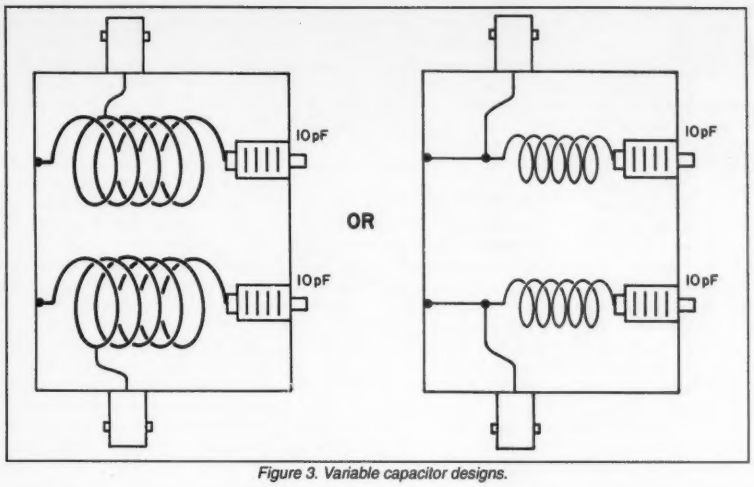

Figure 3. Variable capacitor designs.

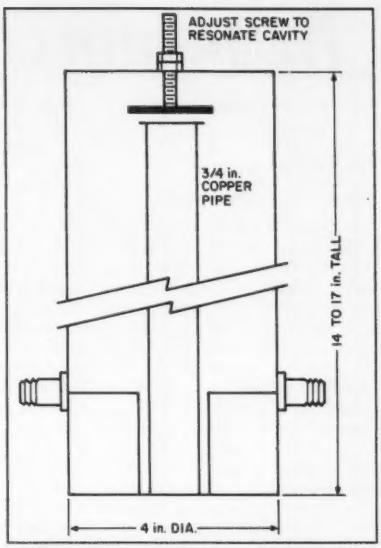

Figure 4. High power cavities (quarter wavelength).

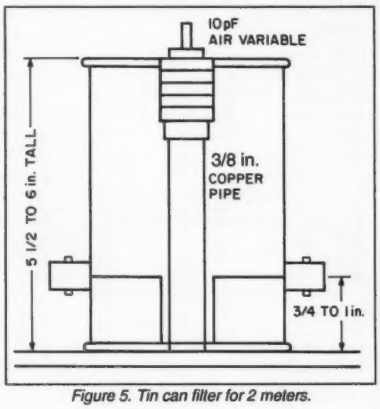

Figure 5. Tin can filter for 2 meters.

space coil—the principle is nearly the same.

Component RF Heating

If you think component heating due to RF is not much of a concern, let me tell you about a 6 meter amplifier I built. This amplifier depicts heating to an extreme. The circuit was a single-stage amplifier using a half-turn input and output inductor for the tank circuit. Initial tests showed very low output power. I made adjustments but there wasn't any particular improvement.

Soon I realized where my errors were. Due to long key up, the output coupling capacitors were squirming about the PC board in a pool of molten solder! The capacitors were dissipating so much RF current they conducted heat to their leads and melted the solder. The trouble turned out to be that the half-turn inductor was just too short. The cure was simple: increasing the inductance a small amount. I changed the total length by adding 1/8 inch of #12 wire, making the total inductor length now 3/4 inch long for its half-turn loop.

Testing after this change produced output power of 80 watts with little trouble. Now it would have worked at the 45-watt level, but for how long? Check out RF heating of the components—it is very important to remain within good engineering ratings.

High Power Cavities

Designs for higher power levels require a more traditional cavity design, allowing very high RF currents to flow through large conductor surfaces. The air-spaced multi-rotor capacitor is replaced by a single top-loading capacitor, or changed by adjusting the center element length along with cavity length to make it resonant. This tends to make the size large because the center element must be very near 1/4 wavelength to be resonant, either by minimum capacitance or by element length, making circuit "Q" quit high. A cavity for 2 meters will be quite large, something very near four inches in diameter and between 16 and 20 inches long.

The top of the cavity usually consists of a single capacitor hat to bring the cavity to resonance. Several cavities can be grouped together to form a diplexer. The cavities in a diplexer configuration will isolate receive and transmit frequencies from a repeater, connecting them both to a common antenna. Diplexers usually consist of four to six cavities for a single pair of frequencies. There are two sides to any diplexer, with half the cavities split between receive and transmit.

As shown previously, simpler cavities can be constructed more compactly by replacing the end element with an adjustable capacitor fixed between the end element and ground. You just have to remember that the capacitor is the power-limiting component here. See Figure 4 for a single cavity for high power use. Additional multiple matching lines and cavities can be used to construct a diplexer that is not unlike most repeater diplexers in use today.

As shown in Figures 1, 2 and 3, the length of a cavity/tuned circuit can be reduced by using bulk components. This allows small tuned circuits to act as filters, with the limitation of lower power operation. Use small 1 to 10 pF variable capacitors. I limit this type of design to the 10-watt level just for a component rating margin. You can push it but be cautious—don't worry about your capacitor, worry about the failure the short will do to your solid-state power amp in your rig.

The Tin Can Filter

The simplest filter to construct is the Tin Can Filter. For this filter all you need to do is to punch a hole in the top of a can (a little longer than a soup can) and add a variable capacitor, soldered to a central copper rod or pipe. Ground the bottom end of the pipe to a plate that connects common to the end of the open can. Taps for the input/output are constructed out of #12 buss wire one inch high and placed in close proximity to, then routed directly to, ground, next to but not touching the central element. The two connections or loops are placed 180 degrees apart. Adjustment is also simple: Connect to an existing system and adjust for maximum signal strength through the filter. Please note that this is a sharp bandpass filter and will be limited to a couple of hundred kHz. This type of filter is intended for spot frequencies only. See Figure 5 for details. It is a very non-critical filter to construct. Adjust all filters on receive for best performance and then test on low power with an SWR meter to find the best match.

Next month I plan to describe a noise generator that you can use to check out your receive systems for best performance. It's quite a simple project, with the noise head having less that five parts.

Well that's it for this month. I hope you and yours have a very merry Christmas and a happy New Year. As always, I will be glad to answer questions concerning filters and other related VHF/UHF matters. Please send an SASE for a prompt reply. 73 Chuck WB6IGP.

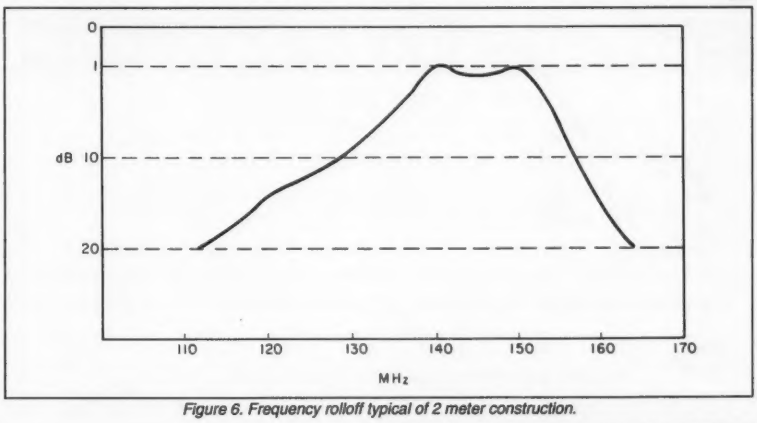

Figure 6. Frequency rolloff typical of 2 meter construction.

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The Art of Grantsmanship

If you are a teacher in a public school, sooner or later you will find yourself in the position of needing or wanting more money for your classes. If you are a teacher using amateur radio in the classroom, you will definitely discover the benefits of having a cash flow at your disposal. While there are many grants and scholarships specifically aimed at the amateur radio community, you should not limit yourself to applying for only those offerings. When it comes to bringing funding into your school for your program, you should leave no stone unturned. In this column I'll pass along some basic tips for good proposal writing, and give you some resources to help you get started.

Private Sources

With all the budget cuts going on in government today, the trend for funding is shifting from the public to the private sector. The list of foundations awarding grants to elementary and secondary schools and community and nonprofit organizations continues to grow. Sometimes, finding a starting place is the most difficult task.

As an aid in finding that starting place, Government Information Services and the Education Funding Research Council have compiled a list of 60 foundations to contact for funding for your program. I'll list a few of the foundations, along with the general type of support they offer. This information is intended as a starting point only. Anyone interested in specific foundations should contact them individually by mail. Address query letters with the contact name, followed by the name of the foundation and the address listed.

Alcoa Foundation: Awards for education, arts and cultural programs, community development, and youth. Uses: special projects, seed money, equipment, budgets, research, emergency funds. Contact: Earl Gadbury, Pres., 1501 Alcoa Bldg., Pittsburgh PA 15219; Telephone: (412) 553-2348.

Coca-Cola Foundation: Awards for school improvements, literacy programs, arts and culture. Uses: scholarship funds—commitment to $50 million over the next 10 years. Contact: Margaret Cox, Vice President and Executive Director, 310 North Avenue, Atlanta GA 30301; Telephone: (404) 676-3740.

Exxon Foundation: Awards for elementary, secondary, and higher education. Uses: special projects and budgets. Contact: Dr. Arnold Shore, Exec. Dir., P.O. Box 101, Florham Park NJ 07932; Telephone: (214) 444-1104.

Alfred P. Sloan Foundation: Awards for science and technology. Uses: seed money, research, special projects, general. Contact: Albert Rees, Pres., 630 Fifth Avenue, 25th floor, New York NY 10111-0242; Telephone: (212) 582-0450.

Amateur Radio Sources

Many amateur radio organizations offer scholarships and grants to young people involved in the hobby. The *Quarter Century Wireless Association* and the *Dayton Amateur Radio Association* are two of the more well-known groups that can be contacted for specifics about their awards.

The ARRL Foundation has established the *Victor C. Clark Youth Incentive Program*, with the objective of providing support for the development of amateur radio among high school age youth. The Victor C. Clark award is funded by an endowment, and will be awarded as a mini-grant to groups who are high school radio clubs, youth groups, and general interest radio clubs sponsoring subgroups for young people or otherwise making a special effort to get them involved in club activities. For further information about this grant, contact: Mary Schetgen N7IAL, The ARRL, 225 Main St., Newington CT 06111; Telephone: (203) 666-1541.

Government Funds

Let's not forget that our Congress wants to help improve math and science instruction, as demonstrated by the $125 million allotment for the fiscal year 1990. Funds are allocated to each State Educational Agency annually, and at least 90% of these monies filter down to the Local Educational Agencies (LEAs) requesting them.

Teachers should first make their needs known to their curriculum director or department head. District supervisors review all teacher "wish lists" in committee, with some districts determining a priority list through the use of collaboratives that include university, museum, and local business representatives.

From a prioritized list, the LEA can apply for the Eisenhower funds in the form of a specific grant. *LEA Title II/Eisenhower funds* can focus on the local community but must support activities related to statewide priorities. Because the purpose of these funds is to improve the quality of math and science instruction, other disciplines cannot request grants from this allotment.

Keep Trying

I'd like to caution you not to be discouraged if your amateur radio project doesn't seem to fit into a pre-existing category for grants. Many times the grant will be awarded because of its unique approach in teaching and its obvious value to the community for good will and assistance.

Don't forget to inquire into possible grants from your *local utility companies.*

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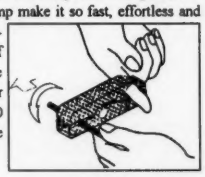

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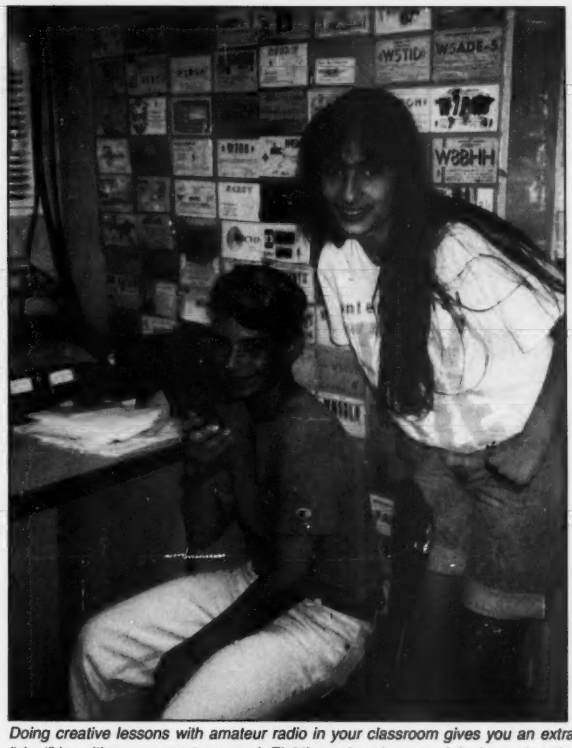

Doing creative lessons with amateur radio in your classroom gives you an extra "slant" in writing your grant proposal. Eighth graders Jason and Jo Ann gain valuable operating experience at the ham station.

Public utilities often offer many free materials and are receptive to sponsoring educationally sound programs.

In our community on Staten Island, New York, we have been very successful in convincing the *McDonald's and Burger Kings* to be supportive of our radio programs in the schools.

Another good idea is to approach *local businesses*, especially electronics companies, and offer to publicize their names if they can offer assistance, materials, or equipment.

You can request through your local school district office to receive the "Office for Sponsored Research," a biweekly update of available grants for education.

Writing the Proposal

Some helpful hints to keep in mind when you write your proposal:

Pay attention to the appearance of your paperwork. The reader will definitely be influenced, pro or con, by the readability (font and size of type used) and neatness of the proposal.

Be very specific about the objectives in your proposal. Although many funding sources do not require a Program Overview or Abstract, it is important to write one and place it before the narrative. In one page, the Program Overview or Abstract should briefly describe your project. It should state who is developing the project, the specific goals of the project, the problems or needs the project will address, the target population, the activities you have selected to solve the problem addressed by the project, and what you expect to accomplish.

Follow all agency guidelines. Make sure you have included everything that is asked for.

Double-check for spelling, grammatical or typing errors.

Include appropriate statistics and research. Refer to recognized studies and research programs.

Have other people review and critique your proposal before you hand it in.

Be persistent.

Some good resources for writing proposals can be found at your local library. Among them are: Ammon-Waxler and Carmel, *How To Create A Winning Proposal* (Santa Cruz: Mercury Communications Corporation, 1978); Stewart, *Proposal Preparation* (New York: John Wiley & Sons, Inc., 1984); and Manning & Rugh Associates, *Proposal Management Using the Modular Technique* (Los Altos: Peninsula Publishing, 1973).

Using amateur radio in the classroom as a highly motivational tool for teaching other curriculum gives you a unique and innovative slant in your proposal. Take advantage of the "special" way you approach education, and explore the opportunities for bringing funds into your classroom. Be sure to write to me and let me know how you did with your amateur radio proposal: Carole Perry WB2MGP, P.O. Box 131646, Staten Island NY 10313-0006. Good luck! 73

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The "Oscillator from Hell" Returns

Another year is about to bite the dust, so this month we'll tie up whatever loose ends are laying about and dig into the mail bag.

One of the columns that brought a ton of mail (including some hate mail) to my house was the "Oscillator from Hell" column. Seems even though the soldering iron lays cold, that oscillator continues to cause me trouble.

First things first: The schematic shown in the column had a missing ground connection on the tuned circuits. Many of you may be thinking to yourself, "It's no wonder it did not work, he had no ground on the tuned circuits." Well, there was a ground connection; in fact, several ground connections, to be triple sure the tuned circuits were not floating above ground.

Oh yes, I did manage to get the oscillator to work. I had to remove the 1N914 diode from the FET. That diode seemed to clamp the oscillator so much as to inhibit it from working. Removing the diode caused the damn thing to start working.

The original circuit came from a Doug Demaw QRP notebook. I talked with Doug at the 1992 Dayton Hamvention about the trouble I was having and he told me he encountered no trouble getting the circuit to work. In fact, he had a finished version of the DC receiver using the very same oscillator. I'm still not sure why I've not been able to get it to work as it should.

But, I've had quite a few really good answers to my question of why it did not work. For those who did take the time to write, thanks! I replied to all the letters and sent along a complete schematic of the project I was trying to get to work. Many of the letter writers suggested a different type of circuit altogether. The oscillator circuits were split about half and half between using an external active device in a VFO circuit or using the on-chip oscillator of the NE602. A good example of using the internal oscillator of the NE602 as a direct conversion receiver can be seen in both the Sudden and the Neophyte receivers. Both use the NE602 mixer as an oscillator for the VFO and front end (mixer) of the receiver.

I've included some of the better schematics for those wishing to build up a working VFO for their projects. I've not had the time to reproduce them, so it's builder beware! There is no guarantee they will work and experimentation will be needed. I hope this is the last I hear from the oscillator from hell!

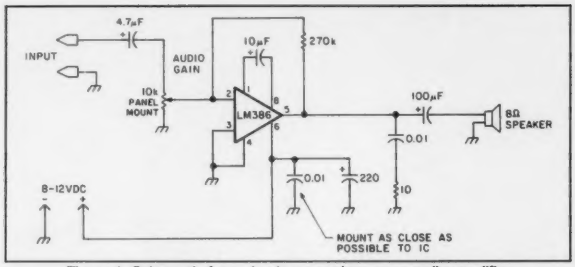

Figure 1. Schematic for a simple general purpose audio amplifier.

QRP Frequencies

I've received requests for the QRP frequencies, too. I've had these in the column many times, but here they are again. You'll find QRP operators on or near these frequencies: 3.550, 7.040 (and look for G-QRP members on 7.030) 7.060, 10.105, 10.115, 10.123, 14.060, 21.060 and 28.060 MHz. There seem to be no special QRP frequencies for the WARC bands, and the ones I have listed for 30 meters are not backed by any group or club. I don't know of any QRP calling frequencies on the 18 and 24 meter bands.

If you're really into milliwatting with the FireBall transmitters (November 1990), then look for others chirping away on 28.060, 28.322 (CW or voice) and 28.636 MHz. The Fireball transmitters run about 50-60 milliwatts. You'll be surprised how far you'll be able to talk with that much power on 10 meters.

A Simple Audio Amplifier

I've been asked by several readers for a simple general purpose audio amplifier. I've got just the thing you need! (See Figure 1.) It's simple, easy to build and works like a champ. You'll be able to get all the parts from Radio Shack. There is no PC board, but you should have no trouble putting this circuit together on a small piece of perfboard. I use the stuff the shack has hanging on the wall; it has a copper pattern on one side of the board, making it very easy to solder IC sockets and other parts to the board.

A LM386 is the heart of this project. I know, why use the 386 when there are so many different (and better) audio amplifier chips available? Well, number one, Radio Shack has this part hanging on the wall! The 386 is normally easy to tame and you'll get about 500 mW of audio from it. It won't rattle the front windows, but it provides more than ample audio for most projects.

A low value capacitor couples audio into the 10k pot. This is the gain control (volume) and should be a panel-mounted part. The speaker is coupled from the output of the 386 via a 100 µF capacitor. Don't forget to add the 0.01 cap and the 10-ohm resistor on the output of the 386. Also, don't forget the de-coupling capacitors on the VCC line either. If you are using an external power source for the amplifier and the amplifier breaks into oscillation, you might want to increase the value of the 220 µF capacitor. Doubling or even tripling the value of the 220 µF capacitor may be needed to tame the 386 audio amplifier.

Construction is so simple, we'll keep it very short. Use a socket for the LM386 and keep the leads short to and from the chip. After you have assembled the circuit, test it before you put it in a box. Apply +8 to +12 volts and check to be sure there is voltage on pin #6 and nothing (GND) on pin #4. You can use a standard 9-volt battery to run the amplifier, but it won't last too long. A better way would be to use a 12-volt supply. Steal this from any source you might have in the shack. But, watch out for the wall sucker transformers. They're usually not very well filtered and may cause the entire circuit to oscillate and hum badly.

Testing is simple. Turn the gain control all the way up and, using your finger as a noise source, touch the audio input jack. This should produce a loud hum in the speaker. Button the unit up in a cabinet of your choice. I installed my unit in one of the plastic project boxes from Radio Shack. RCA jacks are used for audio input, as well as a standard 1/8-inch jack. I placed the speaker inside the project box. A coaxial jack allows me to power the amplifier from a variety of sources.

I now have a handy universal audio test amplifier—just the thing for testing out a direct conversion receiver or for using as a troubleshooting aid in receiver repair. I guess it would make a good audio add-on for a crystal set, too!

Looks like that's all the space this month. If you like what you've been reading here in the "QRP" column, then by all means send in the reader Feedback card. If nothing else, you might win a free subscription (or renewal) to *73 Amateur Radio Today*! Also, if there is something you would like to see in the column, ASK! I can be reached via CompuServe (73357,222), America online (Michael 1087), and Prodigy (PPGJ40E). Of course, I have a large mail box and a friendly mail person, so USPS works just fine, too. 73

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73 INTERNATIONAL

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Notes from FN42

I was very disheartened when I opened a letter from Vaughan Henderson ZL1TGC while preparing this column. He reports the Silent Key status of Des Chapman ZL2VR, 73 Hambassador for New Zealand. Des has been a regular contributor to 73 for many years and always served his country well with his timely and informative reports. His presence will be missed by ALL hams throughout the world.

Vaughan has volunteered to become the new Hambassador to New Zealand. I have reprinted his very informative letter to me under the New Zealand banner.

A letter from the Republic of Slovenia gives us some hope as to the well-being of the ham population there. One ham club developed an introductory ham radio course and graduated 14 young hams. This effort then caused the development of a ham radio club with a clubhouse. Just think what could happen if all of our cities, large and small, ran ham radio courses just once a year!

Fourteen new hams each year seems so very small when you look at it as just an individual news item, BUT what if those 14 were multiplied by the number of cities where there were at least one licensed ham willing to dig down and spend several hours a night for about 11 or 12 nights? I have even heard of "cram" sessions lasting just a weekend, preparing students to take the licensing examinations.

What's two hours a week for 12 weeks? I know I can waste that much time very easily just sitting in front of the television, probably more like two hours a night. All it takes is for someone (maybe even YOU) to mention the idea of having ham classes, giving something back to your hobby.

I mentioned that a group of hams in the Keene, New Hampshire, area did just that during the late spring, and the experience was so rewarding that we all agreed immediately following the last session that we wanted to do it again in early 1993. I am very happy to report that all (approximately 30) of the students who completed the course now have a ham license of some sort and that one has completed his Advanced. They are all very enthusiastic about the hobby and some have even volunteered to help during the next course. If you have never experienced the feeling it gives to be one of the teachers, there is nothing like it. As one of the US TV commercials says, "Try it, you'll like it!"

Lastly, this is a very special time of the year for many of our readers. I wish that each and every one of you has a very joyful experience and begins the New Year with the joy in your heart of Peace On Earth, Good Will Toward Your Fellow Man.—Arnie, N1BAC.

Roundup

Philippines *Letter from Rene A. Aguinaldo 4F2IR:* Special Event Station 4G2BAG, commemorating the 83rd founding anniversary of Baguio City, Philippines, was conducted by members of the Benguet American Radio Operators Network Society (BARONS, Inc.) and the Texas Instruments Amateur Radio Club (TARC, Inc.), both duly licensed and recognized amateur radio service clubs by the Philippine Amateur Radio Association and the National Telecommunications Commission of the Philippine Government.

Baguio City, the summer capital of the Philippines, is approximately 250 km north of Manila in the Province of Benguet. It has an elevation of about 1.5 km above sea level and an average year-round temperature of 18 degrees centigrade.

Operation was conducted starting at 0000Z 26 August to 2359Z 7 September 1992 with phone and CW on the 40, 20, 15, and 10 meter bands only. A temporary operating permit was provided by the National Telecommunications Commission Regional Office #1.

Participating operators were: Renato DU2BAD, Gel DU2RK, Alvin 4F2AWE and Rene 4F2IR. Other members of both clubs provided the logistics and financial support. BARONS and TARC were also the same hams who operated the DX2VOA special event station (commemorating the 50th year of VOA worldwide broadcasting) last February (1992) with Tom W7LUU as the lead operator.

QSL information for 4G2BAG is via the PARA (DU) QSL Bureau, or via DU3DO in the American International Callbook. *[Rene A. Aguinaldo, 4F2IR, Vice President BARONS, 89 T. Bugallon St., Aurora Hill, Baguio City, Philippines 2600.]*

Russia *Short note from Jack UA3RCS:* The Michurinsk Contest Group is issuing the "MCG Medal" for QSOs with MCG members. Contacts after October 1, 1990, are valid. Further information may be received from the Award Manager Anatoly Zheltotrubov, UZ3RV, PO Box 30, Michurinsk, 393740, Russia. A SASE is required. QSL info for R3R, RR3R, RX3ARM, RZ3R and UK1PGO (Franz Josef Land) are via RA3RQT, Andy Yatskiv, at the previous address.

Republic of Slovenia *Letter from Joseph Zelle W8FAZ, translated from Slovenec, September 17, 1992:* In 1964 a primary section of the Sobota Radio Club, Teshanovci, was established. This was the first section among Slovenian villages.

Old-timers like to recall the beginnings and difficulties of the first transmitters. They were helped greatly by Tony Grchar at first. He is credited with founding amateur radio in Slovenia. However, with a few exceptions, activity slowly died away. Then, towards the end of last year, some 30 years later, amateur radio in Teshanovci came alive again.

No one expected such a reaction and so much effort expended by former and present radio amateurs. Last winter, in cooperation with members of the Sobota Radio Club, they successfully developed a course in the elements of amateur radio. The program was intended for local youths and the elementary school of Boginja. The course was successfully completed by 14 youngsters.

During the occasional meetings the members expressed a desire to erect new club headquarters. The original quarters were located in the village's firehouse. Not only were the quarters confining, but the firehouse was located along a busy street. All of this tended to discourage active participation.

With the support of the Sobota RTV Club, the community of Murska Sobota, local groups, and the village board, as well as the unselfish help of numerous villagers and youngsters, last spring they completed the club's new quarters. The quarters are located behind the village firehouse.

Within the new addition are the club room, office, work space, and washroom. At least 30 hours of volunteer work went into the project.

Additional information: Since the Republic of Slovenia broke away from the old Jugoslavia, the international call letter prefix has been changed from YU3 to 4N3. *[Joseph Zelle W8FAZ, 24124 Glenbrook Blvd., Euclid OH 44117-1971.]*

NEW ZEALAND

Vaughan N. Henderson ZL1TGC
217 Glenfield Road
Glenfield
Auckland 1310
New Zealand

I am writing to offer my services as a possible *73 Amateur Radio Today* magazine contributor to the "73 International" column for ZL. Des Chapman ZL2VR, the previous contributor, has recently become a Silent Key, and you may be looking for a replacement.

I think I can do the job. Perhaps a little background will help. I have held an amateur radio licence for 22 years. Here in ZL we have had a non-Morse licence called Technician Grade for about 24 years now (what an enlightened country!!), and I have enjoyed operation on VHF/UHF/microwaves/amateur satellites, and contesting, for all that time. Yes—I am finally having a go at passing my 12 wpm and becoming a fully licensed ham!

In my 22 years I have been involved quite extensively with local clubs—I am a life member of one, having had a hand in setting it up (Wellington VHF Group). Since moving to the present QTH some 14 years ago I have been involved as a committee member, secretary, president, and again latterly as a committee member of the Auckland VHF Group.

What is probably more relevant to writing for *73 Magazine* is that I have written the "VHF Column" for the New Zealand National Amateur Radio Association (NZART) magazine *Break-In* for some four years, moved on from that to write the "Amateur Satellite" column for the same magazine for about three years, and lately have been editor and assistant editor of my local club magazine, *Spectrum*, a monthly 22- to 26-page production.

I have also written the occasional article for *Break-In* magazine, most recent of these has been a write-up of the Technology Convention (similar to the USA VHF Conventions), and prior to that articles on repeater sites the Auckland VHF Group have developed in our local area.

My other activity in amateur radio at present is as a member of the 18-member National Executive—similar to an ARRL Director, except we call ourselves Councillors—and as such am very much up with what is happening in the amateur radio scene in New Zealand. Also, I have a good oversight of international amateur radio affairs, especially in IARU Region 3.

So there you have it! If my background and limited writing skills lead you to believe that I could be suitable for the position, I would be pleased to hear from you.

[Needless to say I am deeply saddened to hear of the death of Des Chapman ZL2VR. He gave us so much during the many years of being the 73 Hambassador for New Zealand. After reading several of the articles written by Vaughan I have concluded that he is a very capable writer and I have accepted his offer to become the new Hambassador for New Zealand.—Arnie]

OKINAWA JAPAN

David Cowhig 7J6CBQ
Packet: 7J6CBQ @ JR6RMV.47.
JNETR6.JPN.AS

Hello to all from David Cowhig. My new call 7J6CBQ came in June with the help of the JARL International Section in Tokyo. Okinawa, a 70-mile-long string bean shaped island running north-south, lies 300 miles from both Taiwan to the south and the rest of Japan to the north. The one million Okinawans have the world's highest life expectancy—84 years—and today include 120 people age 100 and up. Okinawa, located in a frontier area between China and Japan, was strongly influenced by Chinese culture until it formally became part of Japan in 1872.

Okinawa ham clubs are centered around special interests such as contesting, satellites, DX, and foxhunting. The Radio Society of Okinawa, a predominantly American club which meets at the Kadena USO on the first and third Wednesday of each month, offers US ham license examination sessions every three months. Once a US ham license is in hand, getting a Japanese ticket through reciprocal licensing is easy.

The ham bands are a lot different from the US East Coast. Two meter (144-146 MHz) FM activity is all simplex; a dozen tone access repeaters serve Okinawa hams on the 430-440 MHz amateur band. The long narrow shape of the island makes a yagi a good choice even for general work on 2 meters! Aside from the many new callsigns I hear here, I notice that the HF bands are not as crowded as at home (USA), probably because with the Pacific Ocean to the East and China and Russia to the West, hams are not scattered at convenient distances for HF skip as is the case in North America.

Hams in Taiwan (BV), now numbering over 500, can now work mainland Chinese (BY) hams freely. I had a half-hour chat with Fanny BY3AB in Tianjin today, much more interesting than the hello/goodbye contact I probably would have had working China from my home station in Virginia. Speaking of the Chinese, the lower 500 kHz of 10 meters sounds like the CB band when the skip is in—and almost all the voices are speaking Cantonese! The rapid growth and opening up of China will make China one of the big ham radio countries. Equaling the 1.2 million ham stations and over 1.5 million hams in Japan will take some time, however.

The September 1992 issue of JARL News reports that illegal use of 2 meters by truck drivers has become a very serious problem. On July 1, 1992, a study of 144.00 to 144.48 MHz in the Osaka region found that 17 of the 24 stations operating at 20 kHz intervals in this range were illegal. Illegal stations often appear on ham repeaters in the Tokyo area.

Learning how to work in Japanese on packet radio has been a real thrill. I bought a copy of Japanese language DOS J 5.0/V—a version of IBM PC standard DOS which runs in Japanese on PCs having at least 2 Mb (megabytes) of RAM (random access memory), as well as in English in its US mode—for about $120 [US$ I assume]. Next, I got a copy of WTERM, a free Japanese language modem program. To enter the kana and kanji characters of Japanese you need a front-end processor (FEP). You can either use the FEP which comes with DOS J 5.0V (in which case you will need 4 Mb of RAM) or else a more sophisticated FEP, such as WXII, which sells for about $80. Now I was able to work packet using my PK-232 and use one of the fine Japanese language packet RBBSs on Okinawa. Japanese kanji characters and kana are transmitted using two bytes at a time in order to handle the approximately 6,000 characters in the JIS I and JIS II character sets. Enter the commands AX25 and 8bitconv ON so all eight bits of each byte will get through the TNC (terminal node controller) to your computer.

My packet address, 7J6CBQ@JR6RMV.47.JNETR6.JPN.AS, means that my home BBS (JR6RMV) is in prefecture 47 (Okinawa) which is in turn located in the sixth call area (Kyushu region), in Japan, in Asia. Once I am more settled in I will join some Japanese ham clubs and write another report. As the Ryukyu Broadcasting Company jingle goes, I am enjoying my "sunshine shower in Okinawa."

[I remember my time at Kadena and the rest of the island during the late 1960s. It is a beautiful island and has very nice people. I am sure that David will enjoy himself while he is there. I have sent a letter to him to see if he would consider becoming a 73 Hambassador for Okinawa. I have also sent him a packet message so we will see how reliable that method of communication to Asia is.—Arnie] 73

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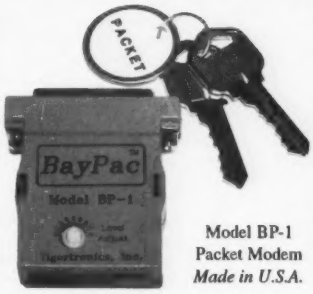

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More Micro Power

Last month, we were exploring the microcontrollers used in modern radios. Let's keep going:

We've discussed most of the functions of a typical micro in a typical rig. Also, we've seen how micros read switches and tuning knobs. But what happens when things don't work? Is it really possible for you to troubleshoot your own digital system, or should you send the radio in for service? Well, it depends on what's wrong, and also on what you feel capable of fixing. If you have a decent oscilloscope and know how to use it, you might have success. If you're armed only with a VOM or DVM and some basic DC circuit knowledge, you'd be smart to find the shipping box; you'd be amazed at how much expensive damage you can do in a few milliseconds' time.

Is It Broken?

Let me state up front that, except in cases of lightning strike or other serious electrical abuse (such as way too much voltage from a malfunctioning voltage regulator), I've almost never seen a micro simply go dead. It can happen, of course, but it sure isn't common. Most of today's micros are made from CMOS, and that's a pretty mature and reliable technology. Those chips can take a lot and keep on computing.

If you've got a rig which doesn't respond properly, be sure the problem really is with the digital section before you start hacking at the micro and its associated circuits. The old computer term GIGO (garbage in, garbage out) definitely applies here. Remember, the micro can only act on the information given to it. For instance, if the radio is jumping frequency or not tuning properly, check the tuning encoder. Is it sending pulses when you turn it? Is it sending any when you don't? (It shouldn't be.) Most tuning encoders are optical, employing a slotted disk between an LED and a photodiode. They tend to be quite reliable, although they do sometimes quit. Don't worry if you can't see any light coming from the LED; most are infrared. Scope the output of the photodiode and see if it jumps when you turn the dial. If not, either the LED is not working, there's no power to it or the photodiode, or the diode is bad. If the pulses are there, check the outputs from the entire encoder. The tuning pulses should be there, and another line should go up or down depending on the direction in which you've turned the knob. If something's missing, you have a problem in the encoder, not the micro. By the way, some encoders use actual switches instead of optical components, and these units are very prone to problems caused by the switches' wearing out and making poor contact. Many walkies use them for the rotary tuning controls, and some HF rigs, such as the Yaesu FT-747GX, use them, too. If the knob has a smooth feel as you turn it, it probably is optical. If it clicks, it may be mechanical.

On the Outs

Output problems may be caused by things other than the digital brains, too. A common problem, especially in rigs with LED and vacuum fluorescent displays, is lack of display or wildly erroneous numbers. Sometimes, random segments may be present. Usually, these problems are not caused by the micro. Let's look at some other causes:

If there's no display at all, check the power to the digits. With LEDs, that's just the line coming from the DC supply, and it probably will be there. With fluorescents, though, it's another matter altogether. Those displays require comparatively high voltages (be careful, please!) and are driven by so-called DC-to-DC converters. The converters actually are little switching power supplies which take the low voltage from the DC supply and step it up to anywhere from 90 to 200 or so volts. In my experience, the vast majority of fluorescent display failures can be attributed to dead DC/DC converters. The usual cause is failure of the switching transistor that drives the step-up transformer.

Most displays are driven by transistors or specialized buffer chips. LEDs only require current buffering, so a bunch of transistors is common. The fluorescents, however, require voltage transformation as well. In other words, the low-voltage driving signals must be changed into high-voltage ones. The special buffer chips which do that are subjected to quite a bit of electrical stress and they are good suspects. Especially if one whole digit, or one segment in all the digits, is out, check that buffer chip. If you can trace the wire for that segment or digit back to the chip's pin, you can use the schematic to figure out which pin is the input for that part of the buffer. It is quite common for just one piece of the buffer chip to open. If the input is there but the segment or digit won't light, you probably need a new chip.

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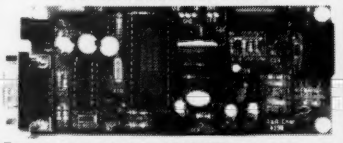

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LCDs are a special case. They are driven by low-voltage AC squarewave signals, often directly from the micro or from a special driver chip. There is extremely little current involved, so the chips almost never go bad. Most LCD problems I've seen were caused by bad contact with the displays themselves. LCDs are constructed by sandwiching the liquid crystal material (which you should *never* touch—it's poisonous) between two pieces of glass. On the glass are etched conductive lines to form the segments and their connecting traces. It all comes out to little conductive spots at the edges of the display. Contact with the radio's PC board is made via strips of vertically conductive rubber pressed between the board's contacts and the display's edges. That's why the display is held firmly against the board in a housing of some kind. It takes good, clean contacts and plenty of pressure to ensure good connections. Usually, it all works remarkably well but, sometimes, especially in the prolonged presence of cigarette smoke, the contacts get gummed up and the display malfunctions. If you're careful, you can disassemble it, clean it and get it all back together again. If you've never tried it, though, I recommend doing your first one on something you don't really care about, such as an old calculator, because it's easy to mess it up and ruin the display.

Hey, It Really Is Broken

If the display is messed up, and especially if it shows random segments, you really might have something wrong with the computer. Here's how to tell: If you can still tune the rig despite the display's malfunction, the computer is OK. If the rig won't respond to any of its computer-related controls, chances are that the computer does indeed have a problem.

Like any brain, the computer needs a support system to make it work. First of all, of course, the power supply must be feeding it the correct voltage. A DVM helps here. If the voltage is close, it should be fine. We're not concerned here with 5.1 versus 4.92 volts. But if it is way off, the power supply needs to be fixed before you can do anything else. And, with some micros, supply voltage that's way too high will cause no damage, while with others, it will cause total destruction of the chip. If the supply's too low, the computer won't work but it shouldn't cause any damage.

After power, the next thing a micro needs is a clock. Usually, there's a crystal right next to the chip. Scope both sides of the crystal, using the 10-megohm setting on your probe to avoid loading the circuit down. If either side shows a waveform, the crystal is OK. If they're both dead, either the crystal is bad or the micro is blown. The easiest way to tell is with another crystal. It's not likely you'll have another one of the right frequency, but you can use anything fairly close for a test. It may not work right, but you'll be able to see if it oscillates.

OK, you've got a clock. That means the crystal is good and the micro is not blown. Notice I didn't say that the micro was good. Usually, if it is not totally blown it will be good, but not always. It is possible for an I/O port or other part of the chip to go bad without taking the entire chip down. It just isn't common.

The final thing a micro needs to work right is a proper reset when the power is turned on. Especially if it is a battery-backed system that maintains data when turned off, there is a sequence that must be followed upon powerup and powerdown. If any element of the reset circuitry fails, the micro may trash the data in its RAM, or it may start up at some unpredictable point in its program, with its registers scrambled. The result is the same: a mess. If the radio has any external reset circuitry, check it out. Usually, there is at least an RC circuit on the reset pin, which holds it up or down for some fraction of a second after power is applied. Check that it is working by scoping the micro's reset pin and turning the power on. Some systems employ multi-chip reset circuits which can be quite difficult to figure out. If you get nothing at all on the micro's reset pin, suspect the reset circuit. If you see a pulse, it probably works. But some micros require several pins to come up in a timed sequence, making troubleshooting next to impossible. Luckily, those kinds of things are more often found in laptop computers than in radios.

The Nervous System

In a simple animal like a walkie, the micro may connect directly to all the inputs and outputs. Or, it may read the keyboard by itself but drive the LCD via another chip. In bigger radios, like full-featured HF rigs, an entire small computer, with many chips, may be lurking behind that front panel. Tackling one of these beasts may not be worth the effort, but that depends on the problem. I remember one rig I had which had no trouble tuning but would not allow mode (USB, CW, etc.) selection. Also, the mode indicators were dead and there was no sound. It turned out that the micro was fine. The problem was in two cheap buffer chips which drove the mode indicator LEDs. The same outputs also set the radio to the various modes. They were dead as the proverbial doornail. They just couldn't handle the current of the LEDs and other circuitry. Finding the trouble was as easy as following the wires back from the LEDs.

Often, though, it's not that simple. Next time, we'll take a look at fixing other digital problems. 'Till then, 73 de KB1UM

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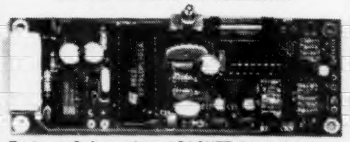

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NEVER SAY DIE

Continued from page 4

readers and advertisers were fed up with Wayne Green. Well, I couldn't blame them for that . . . though I wondered why the monthly reader surveys kept giving my editorials such high marks.

After about three years IDG threw in the towel. It turned out that the circulation had dropped to less than half and over half of the advertisers had been blown away. The magazine was at death's door. IDG (International Data Group) then entered into a contract with me to run it for them, splitting the profits. I snickered. Profits? To my recollection *73* never in its history ever turned in enough profits for us to be able to buy a bottle of black ink for the accounting department. It just never lost enough money to put me out of business. I published it because I felt it was needed, not to live the life of the rich and famous.

I never quite got the hang of that rich and famous thing . . . probably a poor bringing up or defective genes. I still steal the soap from hotels and go for the sausage, egg and biscuit at McDonald's for breakfast when I'm on the road . . . and that's when I splurge. Normally I bring along my own All-Bran, buy some bananas and milk, and that's my breakfast. I like it, plus I prefer to do what I can to avoid a colon cancer exit from life. It almost got my father, so I'm perhaps overly careful.

Hmmm, I wonder if I'm ever going to get around to what I started out to write. My digressions turn into further digressions. I'd blame it on senility except that I've always been that way. So let's get down to the entree here.

How You Can Help

Having asked readers to try and help me convince advertisers to try *73* in the past and never gotten any response, let's say I've learned from repeated failure not to try that angle. That's too much trouble. One or two letters or calls won't dent the decision-makers who're betting all their ad money on *QST*. Nah, the only way to their black hearts is by facing them with sheer numbers. The fact is that we need more readers. If we could double our paid readership I could sell more ads than *QST* and give you one whale of a fat magazine.

So how can we do that? We're increasing our newsstand coverage substantially, so that'll beef things up a bit. But we need far more than that. I'd like to try a test mailing to the *Callbook* list and see what kind of percentage we'd pull from that. With today's postage costs this is a very expensive project, so the sales have to be much better than usually results from direct mail letters.

It would be nice if you could talk up *73* at your ham club and on the air, but that's asking too much. There is something you can do that'll help me a lot. If you enjoy the magazine, in addition to telling me about it the next time you see me at a hamfest, you can start finding out for me why your friends aren't subscribing . . . and let me know. Oh, I get letters from hams who dropped their subscriptions in 1970 when I was pushing repeaters and have never noticed that I've gone on to other enthusiasms. Others got fed up when I started publishing articles about computers and how they worked back in 1975. Many left during the IDG reign and don't know that testy old Wayne is back.

If you can think of any reason, no matter how ridiculous, why anyone should be reading *73*, please drop me a line. I'm looking for ideas and testimonials. Ask around. We used to run over 200 pages a month and we can do it again if we can get more readers. I'd love to have more room to run some of those long, boring construction articles we used to see so endlessly in *Ham Radio* . . . before they got offed by *CQ*. I know there are probably dozens of you out there who'd welcome them.

Of course what I'd really enjoy would be us making enough money so we could put on some DXpeditions, complete with contest-winning readers coming along. That would be a ball. It's fantastic fun working the pile-ups. It doesn't cost all that much, so it's something for us to think about. If we could work up a *73* DXpedition, where would you like to go? No, let's not do Baghdad yet. Maybe some place where they're not fighting, though that sure limits our choices these days.

Or perhaps we could organize jump teams to get right into the middle of every civil war in the world, establishing traffic nets to handle health and welfare messages from friends and families in America. We could vie with P.J. O'Rourke in our reports from the hot spots. Did you read his *Holidays In Hell* or *Give War A Chance* yet? Jump teams? I guess I'd better take some parachute lessons, just in case. I've been putting that off, waiting for a good excuse, but now that I'm 70 and have only who knows how many days left, I'd better get at it. I wouldn't want to leave anything like that undone. I think I'll look into these parachutes with small engines on them . . . I understand that no one's been killed yet trying that. Hello CQ air mobile! I think I'd need one heck of a noise-canceling mike.

Reprise . . . please take me seriously about getting more readers. What do you suggest? And no, we tried doing without my editorials and that didn't help. Stop being nasty, just because I give you an opening. Remember, you'll live longer and much happier if you spread joy instead of your everlasting sarcasm and negativeness. You'll also have a happier family.

Boxboro

Not having learned from their past experiences, the Boxboro Hamfest Committee invited me to speak again. The hamfest pulled a great crowd. The place was packed. Too bad if you missed it. Hams poured in from all over New England and even Eastern New York. A whole pack came from my alma mammy, RPI (W2SZ).

Heck, I remember when the W2 area included only Eastern New York. Just west of Schenectady it was the 8th district. That was before WWII. W2 included only Eastern New York and New Jersey then. That's when 160m was one of our most used bands. That and 40m, which was CW only. 20m and 75m both had 100 kc wide phone bands, both packed solid with kilowatt AM stations. Of course it only took nine nets to fill up the band . . . one every 10 kc. 160m was a Class B licensee band, packed mostly with 5- and 10-watt rigs, often 6L6 oscillators modulated by a 6L6. Crystal control, of course. I remember the old Bliley crystals. They cost about $3.50, as I recall. In today's dollarettes that's around $70, so we didn't buy many. We'd check out a frequency for weeks before buying a crystal, making sure there weren't any rock crusher signals on it. Oh, there were some bargain crystals for half the price, but they didn't have the prestige of a Bliley.

"With the recession hitting New England even harder than the rest of the country, everyone was looking for bargains . . . and they were there."

We had a booth inside with the commercial exhibits where we did a brisk business in *Radio Fun* subscriptions. This is knocking 'em dead. We also sold a bunch of my *Declare War* books, complete with my signature. Several early buyers of the book came by to tell me how much they enjoyed it and a couple even bought extra copies to give to friends. I encourage that.

The Boxboro Committee was one of the first to stand up to the ARRL Central Committee and insist that I be permitted to talk at an ARRL convention. Heck, for many years *73* wasn't even permitted to exhibit at ARRL conventions, much less have me speak. I think the Boxboro Committee broke their back on that one, giving other hamfest committees the guts to fight HQ and put me on their programs. Most of those HQ old-timers are gone now . . . I've outlived 'em.

Batteries

While I'm reminiscing, I wonder how many of you remember the batteries we used for radios back in the '20s? We had A, B, C, and D cells. The A-cells were also known as bell batteries because they were used in sets of four to power door bells. They were about 2.5" in diameter and around 6" high and provided 1.5 volts. We used two of 'em in our broadcast radios, with a rheostat to drop the voltage to 2.5 volts for the 01As and then later the 56, 57, 58 series tubes. B-batteries had 45 volts and they came in various sizes, all large. C-cells ran 7.5 volts and were used to provide grid bias voltage. They usually had taps at 3.0, 4.5, and 6.0 volts.

D-cells are still with us. Flashlight batteries. Once cathode resistors were invented to develop grid bias, the C-cells were no longer needed. These were around 2.5" by 4" by a half inch, made up of five cells in a tar binder. The larger B-batteries were made up of 30 D-cells wired together. Radios first used 90 volts, then went to 135 volts, and finally to 180 volts, requiring four big (and expensive) B-batteries.

Early radios, the kind I remember from childhood, before the superheterodyne, had big tuning dials on all three amplifier stages. Now I wish I hadn't taken apart all those radios friends gave me to get 'em out of their attics. As soon as they found out I was "interested in radio" I had old sets piling up in my basement.

Late in the '20s B-eliminators began to replace the batteries. These often used BH rectifiers. Later they invented 80s. The early amplifiers had 205H tubes and a big speaker that sat on top of the radio. It was about two feet in diameter and was like putting a big paper cone on an earphone unit.

I lived a block away from the Vitaphone movie studios in Brooklyn and used to find these enormous super heavy duty 45-volt batteries in their garbage. They used to throw them out with lots of juice still left in 'em so as not to take any chances with their cameras running out of power. I had over 2,000 volts to put on a 6L6G from a stack of these batteries. It was okay as long as I didn't hold the key down too long.

Then came 83 rectifiers, 816s, 866 Jrs, and finally those lovely blue 866s. My first big rig had a T-125 in the final. I ran across the sales slip for it from Fort Orange Radio recently. I was able to wipe out every broadcast radio in the freshman dorms at RPI with that rig. They were just fine about it though. The proctors said they had no objection to my operating all I wanted . . . between two and four in the morning. Oh well, that's when the 160m DX was best anyway.

Rotten Wayne Green

Now and then I get a really nasty letter from a reader who's mad about something. At first I considered being upset by these letters, but after some thought I realized that the only real measure of the success of my ideas lies in the quality of my naysayers. If I start hearing from intelligent complainers then I'll know I've got a problem. In the meanwhile I'll continue to enjoy the reason-challenged complaints.

For instance, there's the wonderful brouhaha over gay hams. I got a real hoot when I wrote something sarcastic about those who get their bowels in an uproar one way or the other about gays. So *Monitoring Times* reprinted some of my comments out of context, thus apparently trying to make me appear anti-gay. This triggered a letter from a gay militant who took *MT* seriously and believed what he read. For the record, before I ran into the (censored) gay chap running Lambda and his self-promoting frivolous lawsuit against the ARRL, I was neither pro-nor anti-gay. In the light of his fanaticism I may have to re-evaluate my position. I do know that I am so anti-lawyer that any ham or ham group that stoops to suing goes right to the head of my fecal list.

I Get Complaints

Then, while I'm generally swamped with compliments on my hamfest and convention talks, I got a note from someone bitching that I used the opportunity to promote my stuff. You bet I do! I didn't know I ever made any beans about that. I promote *73*. I promote *Radio Fun*. I promote my new book, *Declare War*. I promote my CDs and music publications. If I had any other businesses I'd promote them too. But I plead guilty with an explanation.

You see, as I've explained before, none of these enterprises are aimed at making loads of money. I can't let them lose too much, but each was started because I saw something that I felt needed to be done.

One of the goals of *Declare War* is to help fix our terrible educational system. And a big part of that fix has to do with getting our kids to take an eight-year course in the fundamentals of electronics, communications and computers. This is the only way I see for us to have a chance at generating millions of new hams . . . millions of kids interested in technology . . . so we'll have the high-tech career engineers, scientists and technicians we must have if America is ever going to regain its consumer electronics industries. If I thought for a minute that this goal was beyond hope I'd fold my ham magazines and petition the FCC to close down our ham bands as a waste of valuable frequencies.

So yes, you bet I'm pushing my book at hamfests. I'm pushing it on every radio interview I can, at every service club meeting and so on. I want to see millions of youngsters coming into amateur radio. From there my *Radio Fun* will get them to have fun with packet, satellites, transmitter hunts, DXing and so on. Then, with *73*, we'll go on to encourage them to build gadgets, to start experimenting and pioneering new modes of communications.

Sure, I talk about my music businesses. I happen to think that the hams who have no other interests are wasting their lives. They should be interested in music, in art, poetry, reading, photography, and other things. They should be out with me skiing in Aspen in January. They should be down in the Caribbean skin diving, with or without me. They should be learning to fly, trying out ultralights, parachuting, climbing mountains, bicycling, and so on. We don't need a bunch of monomaniacal dweebs making us look like jerks.

I've got to take some time and get used to these rollerblades I bought. And I really have to get out and bicycle around New Hampshire . . . try sky diving . . . see how good the white water rafting is up here, and so on. Well, I just bought a couple of bicycles, so we'll see.

Poverty Sucks

I'm also a real pest when it comes to hams not having money. There just isn't any good excuse for this other than a lack of motivation. There's tons of money to be made. There are unlimited opportunities. There is just no good reason for anyone to be short of money. And hams have a gilt-edged license to make money if they do anything more than waste their time by merely memorizing the Q&A to get their ticket. We see far too many seven- and eight-year-old hams who've gone on to Extra class and understand the technology for anyone to have a good excuse for not taking advantage of the hobby to learn about electronics and communications. That's just pure laziness.

When I run into old-time hams who are bewildered by transistors and antennas, I have little respect for them. When I ask for a show of hands at my talks and I see one lonely hand go up when I ask how many there have gone on DXpeditions, I cringe. How many are making contacts via our satellites? Three hands. Ugh. How many have worked over 300 countries? One hand. How many are on packet or RTTY? Six hands. Jeeze. How many have helped a newcomer get a ticket in the last six months? Four hands.

There are an almost unlimited number of ways to capitalize on electronic skills. There are tons of VCRs, TVs, computers, hi-fis and so on which need repairs. Then there's the fast-expanding security business. Millions of homes, apartments, offices and warehouses need security systems. I've worked in radio and TV stations, in a radar research lab, manufactured loudspeakers, and so on. I've manufactured field strength and power meters. I've put together and sold thousands of parts kits. I've built special radios for receiving WWV/CHU time signals for rallyists. Only your imagination will limit your success.

Declare War

My book describes fairly simple so-

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lutions to most of our major political problems, but if the general public doesn't do anything about the opportunities they have to make big changes in Congress, the federal and state governments, welfare, crime, prisons and so on, our country is going to continue to sink and we're frittering away everything we fought for in our wars . . . everything people came to this country to find. Then I see how few hams are taking advantage of the enormous opportunities they have to learn and be of value and I get discouraged. Should I just give up and learn to play golf so I can take out my frustrations on golf balls?

I've been writing about how the mind works . . . the first time I think this information has been in print. With some encouragement I'll continue and explain how to repair the mind. That's going to be a lot of work to write, so I'm not going to spend my time unless I get a whole lot of encouragement. A couple dozen letters aren't going to do it. But perhaps you'd rather I just write more about the messes we have on our bands and stick to amateur radio.

Yes, I know how to fix a great many of people's phobias, compulsions, and even some major medical problems. Yes, I can explain exactly how to tackle these things so that almost anyone can do it. Is this Wayne Green baloney and exaggeration? Check back over my 40 years of writing editorials and let me know when I've ever made claims I couldn't back up. Ever.

I do my homework. That's why I'm able to get up in front of a large group and talk with confidence. I have to know more about what I'm talking about than anyone in my audience or I'm going to be in trouble.

The Universal Hobby

Speaking of messes, I'm about to do an about-face on the 14.313 garbage heap. Instead of rubbing the League's nose in the mess they've encouraged and abetted, I'm coming around to a new concept. We want amateur radio to have something for everyone, right? So why shouldn't we set aside one special frequency for our psychopaths and mentally-impaired to have free rein? Every time we run into a brain-challenged ham let's encourage him to move to 14.313 and have at it. If that gets too full, then we've always got 14.275 as a back-up sewer. Let's figuratively flush our amateur toilet on these two frequencies, since nothing we can do will make them stink worse than KV4FZ and K1MAN already have.

I hope I get some good answers to my request for suggestions for setting up my station with a whopping signal. I've been listening to Rush Limbaugh recently and I think I can pontificate right up there with him and even at equal length. The only big difference is that instead of knowing I'm right about everything, I know there's more to learn. All I can do is pass along what I've been able to learn. That's the one main difference between religion and science . . . scientists continually have to admit that they're wrong as new data emerges. Religions are never wrong, no matter how much evidence there is to the contrary.

Will our religions last another hundred years? Probably . . . but time could be running out on some of them. If we're actually able to improve our educational system it's going to make things far more difficult for fundamentalist religions.

December 1942

It was 50 years ago that I joined the Navy. My hamming came to an abrupt halt on December 7th, 1941. I'd just won the Eastern New York section award for the Sweepstakes contest and was having a ball. A special close-out on classical records by Radio, Wire, Television . . . later to become Lafayette Radio . . . had gotten me off on a classical music kick. That stood me in good stead in 1952 when I went into the speaker manufacturing business . . . and again in 1984 when I started publishing a music magazine.

I tried volunteering for the Army Air Corps, but they didn't want anyone with asthma. I was allergic to almost everything, having inherited plant allergies from my mother's mother and animal allergies from my father. Came hay fever season and I was a mess.

Then Tom Jones, who'd worked for my father with American Export (transatlantic) Airlines and had rejoined the Navy as a Lt. Commander when the war started, put me in touch with Commander Bourne, who was running the Naval Research Lab at Anacostia, just across the river from Washington. I took the train down for an interview. He wanted me for his lab, but first I'd have to go through radar school. Radar was then top secret, so there was no other way to learn about it.

I went home to Brooklyn, packed my bag, returned to Washington and joined the Navy. They sent me to the Washington Navy Yard where, since

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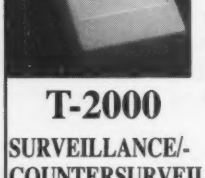

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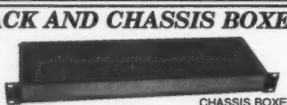

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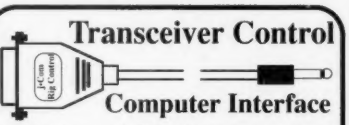

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they were out of uniforms, they gave me three-week's leave. This luckily allowed me to be with my folks for Christmas.

The Gypsy's Prophesy

One odd thing happened during this time. My grandmother and I were in New York doing some Christmas shopping. We stopped off at a gypsy tea room for lunch. The lunch naturally included a tea leaf reading. The gypsy looked at my tea leaves and then at me. She was puzzled. She said it looked as if I was in the military, but for some reason wasn't in uniform. This wasn't normally legal, so it was very unusual. I nodded impassively. She then went on to say that someone with the initials TJ had recently had a big influence on my life. She said she saw me in a very large building and that in some way I would come out on top. She didn't know what that meant, but that was what she saw.

The large building turned out to be the Bliss Electrical School in Tacoma Park, Maryland, where I spent the first three months of my Naval electronics schooling. Being a ham, this was duck soup for me. I loved every minute of it and graduated number two in my class, but only by a hundredth of a point margin. At the time I was disappointed because if I'd been number one I'd have had an option of taking the advanced course in Washington instead of Treasure Island, in San Francisco. And that, in turn, would have undoubtedly eliminated my deciding to go to sea on a submarine instead of the research lab.

Commander Bourne said to let him know when I was graduating from radar school so he could cut orders to bring me back to his lab. The course at the Radio Materiel School on T.I. lasted six months. It was superb. It's amazing how much you can learn when you work at it all day every day. I did well there and earned my Radio Technician second class stripes on graduation.

Land Or Sea?

Then I was faced with a big decision. Should I call Bourne or go to sea? I figured that a research job probably would be better for someone who was married and would be missed more than I, so I decided to go to sea. In retrospect I probably would have been more valuable to the war effort if I'd gone back to the lab. Even at sea I was busy designing and building radar target alarms, setting up a remote radar screen in my bunk, testing out a new underwater sound system concept, and so on. I turned the radio room into a research lab when I wasn't on watch or sleeping.

Once I'd decided on going to sea I wanted to pick a ship where I'd be in charge. I don't do well taking orders, so that was the best approach. I found this meant either a destroyer or a submarine. Knowing that submarine pay and food is better, I opted for that. Besides, I liked the concept of either coming out intact or not coming out. You don't stand much of a chance of losing an arm or a leg, just your life . . . and you know kids of 20 think they're indestructible.

So I volunteered for submarine duty. This meant taking a physical exam. Big deal. I reported to the infirmary for the exam. While I was waiting with a bunch of others I noticed them memorizing the eye chart, just in case. My eyes were much better than most people's . . . I could read signs two blocks away and read microscopic print . . . so I wasn't worried, but having nothing better to do I memorized the chart too. I still know it forward and backward . . . DEFPOTEC and CETOPFED. I can read it with my eyes closed.

Disqualified!

When my turn came the doctor looked at me and said I was rejected. Huh? He said I was overweight. How much am I overweight? He tried to get me to leave, but I insisted, so he looked it up. Eight pounds. Hmmm. Okay, today's Friday, if I come back Monday eight pounds lighter, will you accept me then? Sure.

When I reported back to the school they asked if I'd passed my physical. I said I had to go back again Monday. I spent much of the weekend on the obstacle course. I didn't eat or drink anything. I went into San Francisco and spent about three hours in a steam bath, sweating as much water out of my system as I could.

On Monday morning I reported back to the infirmary. They weighed me and found me 10 pounds lighter. Wow, I'd made it. Almost. The doctor looked at me again for a moment and said I was still disqualified . . . flat feet. Now what in hell do flat feet have to do with submarine duty? I was furious and I staggered back to the school, weak from hunger, thirst and a weekend of endless exercise.

The school yeoman asked me if I'd passed the physical. I said sure and rejoined my class. Wouldn't you know they were in the middle of a strength test at the time . . . and I could barely stand up. Even so I did well chinning myself and got a good score for the tests.

Later, when we were being particularly nastily depth charged, I'd go back to the yeoman's file on my submarine and admire my medical record with the big red stamp on the front, "Disqualified for Submarine Duty."

When we were graduating from the school they gave us an opportunity to sign up for $10,000 in life insurance. Who needs that, I laughed. After my first war patrol I decided that the Japanese were really serious about killing us. In fact they'd come much too close a few times. So I applied for the insurance.

Two war patrols later I got a letter saying that the doctor had missed filling in one of the blanks on the application so I had no insurance yet. Having survived a whole lot more depth charging, strafing, and bombs being dropped on us (and missing), I said to hell with their miserable insurance. When we had some very close calls and none of us were at all sure we

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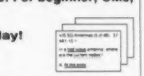

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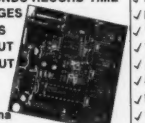

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were going to make it, I thought perhaps I'd made a mistake in passing up the insurance.

Actually the insurance was a pretty good deal, so I finally signed up for it the day they mustered me out a couple years later.

Reunions

My old *Drum* crew gets together every year for a reunion. At first I put off going because I really didn't want to see all those kids I lived and worked with 30 years before as old men. None of us like to come to grips with the fact that we're getting old and this would force me to face it. After a couple of years I started attending reunions. By then many of my old shipmates were already dead. The smokers, mostly.

I go every year or two, getting together with fewer and fewer each year as my old buddies die off. We meet in Mobile, where our old boat is tied up next to the *Alabama* in Battleship Park. If you're ever down there please stop and visit the *Drum* SS-228 and see where I spent most of the war. You'll also have a chance to read the early "*Drum* Newsletters" I put out, complete with some great stories of the things that happened to us. They're framed and hanging on the bulkheads. I was the only one on the boat with a camera, so I had tons of pictures for the newsletter. I even had my own developing tank so I could process my film anywhere we stopped for a refit and rest camp between war patrols.

A lot of people aren't comfortable in submarines. It's a poor place for claustrophobics. It's even a bad place for nervous people, particularly during a serious depth charge attack. It's hot . . . often running 150° or more. You don't dare make the slightest noise and you can hear the screws of the ships above you as they drop their depth charges.

Well, so much for 50 years ago. Oh yes, that summer, before I joined the Navy, I worked at G.E. in Schenectady in Building 89, testing and aligning radio transmitters for the Army. Old-timers will remember the BC-191. It as designed in 1935 and was a huge clunker with a series of seven plug-in tuning units, each the size of a bread box and the weight of a cinder brick. This rig was so crummy it wasn't even worth converting for ham use after the war. It was supposed to be used for command cars and trucks.

The command-set SCR-274N transmitters (and receivers) were a fraction of the size and weight, were far more stable, and put out as much power. These were converted for ham use by the zillions. I enjoyed converting the BC-459s and used one drive my pp-813 kilowatt amplifier when I got into working DX.

Maybe next year I'll write about 1943. Maybe not.

UPDATES

Number 31 on your Feedback card

Packet on the Mac
(Update on Last Month's Update)

Refer to the above article on page 8 of the October 1992 issue. The update of the parts placement diagram (see Figure 2 in the November '92 *Updates* section) is incorrect due to a printing error. The overlay was inadvertantly shifted down in last month's diagram. See Figure 1 in this column for the correct parts placement diagram.

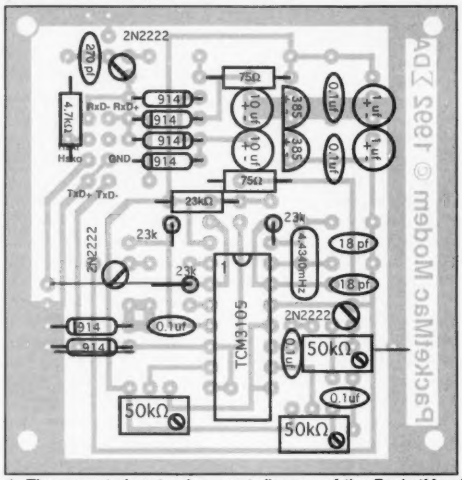

Figure 1. The corrected parts placement diagram of the PacketMac Modem showing the jumper wires as well as the new pad assignments (shown in red). Using these new pad assignments, just follow the wiring hookup chart in Figure 4 in the original article for the proper connections.

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SPECIAL EVENTS

Ham Doings Around the World

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DEC 5

ALAMAGORDO, NM The Alamogordo ARC will sponsor VE test sessions beginning at 12 noon. Persons already holding an Amateur license and wishing to upgrade, must bring their original license and CSCE (if any) and a copy of both. Contact ***Ole WA5IPS, (505) 437-5896*** or ***Larry WA5UNO, (505) 437-0145*** for info. Talk-in on 146.80 -600.

MESA, AZ The Superstition ARC, WB7TJD, will sponsor this year's Hamfest at Mesa Community College, Dobson Rd., between SR360 and Southern Ave., SW campus corner, 7 AM-2 PM. Tailgating. Admission: Commercial $10, Sellers $5, Buyers $2 per car. Talk-in: WB7TJD 147.120 +600; 146.84 -600. Contact ***Bill Howes KG7XB, 718 N. 94th St., Mesa AZ 85207. Tel. (602) 380-4839***, or write to: ***SARC, P.O. Box 1551, Apache Junction AZ 85217***.

DEC 12

HUNTINGTON, WV The Tri-State ARA, Inc., will sponsor W5YI VE Exams at Our Lady of Fatima church school class rooms, 545 Norway Ave. No pre-registration necessary. Please bring a photo ID, copy of current licenses or original CSCE, and a completed Form 610 (Form 610 will be available at the session). Please arrive by 9:15 AM in order to register and have ID and Form 610 checked prior to examination. For info call ***Jim Baker K8KVX, (304) 736-6542***.

DEC 20

MILFORD, CT The Fowler Bldg., 145 Bridgeport Ave., will be the site for VE Exams sponsored by the Coastline Amateur ARA. All classes. Begins at 12 noon. Walk-ins. Contact ***Gary NB1M, (203) 933-5125***, or ***Dick WA1YQE, (203) 874-1014***.

JAN 10

MILWAUKEE, WI The 21st annual Midwinter Swapfest will be sponsored by the West Allis RAC at the Waukesha Co. Expo Center Forum from 8 AM-2 PM. Directions: I-94 to Co. J, south to FT, west to Expo. Advance tickets $3; $4 at the door. Table space: First 4' $3 in advance; $4 at the door. Additional 4' $4 in advance, $5 at the door; electrical outlet $5 if available. Advance reservation deadline Dec 31, 1992. VE Exams given at Red Carpet Lanes (across the street) starting at 9 AM. Write with SASE to ***WARAC Swapfest, P.O. Box 1072, Milwaukee WI 53201***.

SPECIAL EVENT STATIONS

DEC 12

BROOKHAVEN, MS The Southwest MS ARC will operate NM5Z from 1400Z-2400Z to celebrate 175 years of statehood and Mississippi Homecoming. Operation will be in the lower General portion of 40, 20 and 15m phone subbands, and the Novice 10m phone subband. For QSL, send your QSL and SASE to ***Mississippi Homecoming, c/o David Pickard NM5Z, Route 4, Box 386, McComb MS 39648***.

DEC 19

PERRIS, CA The Hams of the Orange Empire Railway Museum will operate KC6TKT and other calls 1900Z-2359Z to celebrate their annual North Pole Limited Steam Train operation. Frequency: SSB 28.340 MHz. For QSL, send QSL and #9 SASE to ***OERM, P.O. Box 548, Perris CA 92572-0548***.

DEC 19-20

NORTH POLE, AK The North Pole Hamsters ARC will operate Station WL7CX from the home of Santa Claus. Operation will be on 20m and the Novice portion of 10m. Send QSL and SASE to ***N.P. Hamsters ARC, P.O. Box 56424, North Pole AK 99705***.

DEC 23-24

SMITHFIELD, NC Triangle East ARA will operate N4SXG from 1300Z-2300Z to commemorate the 70th anniversary of the birth of the late Ava Gardner. Frequencies: CW—3.715 and 7.135; PHONE—14.260 and 28.335. For certificate or card, send QSL and appropriate SASE to ***TEARA, 209 N. Third St., Smithfield NC 27577***.

DEC 30-JAN 1

PASADENA, CA The Relay Repeater Club will operate Station KF6UF, 1600Z-0200Z each day, Dec. 30-Jan 1, from the Wrigley Mansion, to commemorate the 104th anniversary of the Tournament of Roses—104 years of the Rose Parade and 79 years of the Rose Bowl Game. Primary frequency will be 28.460 MHz. Secondary frequencies will be 21.335 MHz and 14.260 MHz. Amateurs in California/Nevada can contact the station on the half hour, on 2m, through the 147.21+ rptr., or on the hour on 220 MHz, via the Condor Connection. For a certificate, please send a QSL with Contact Number and a 9 x 12 SASE with 58 cents postage to ***Relay Repeater Club, P.O. Box 81, Arcadia CA 91066-0081***.

JAN 2-3 and JAN 9-10

FLEN, SWEDEN The 22nd annual Hunting Lions in the Air Contest, sponsored by the Int'l. Assn. of Lions Clubs, and coordinated by the Lions Club Flen (Sweden), will be active on CW from 0900 UTC Sat. Jan 2-2100 UTC Sun. Jan. 3. SSB will be active 0900 UTC Sat. Jan 9-2100 UTC Sun. Jan 10. For rules and info, please write to: ***Contest Committee, Lions Club Flen, Box 106, 642 23 Flen, Sweden.*** All logs must be mailed by Feb. 15, 1993.

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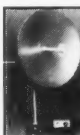

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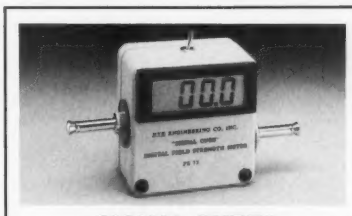

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UW1292

Number 29 on your Feedback card

RANDOM OUTPUT

David Cassidy N1GPH

There was an amateur radio industry meeting at the National Convention in Los Angeles a few months ago. I don't generally go to these meetings, but I happened to be free at meeting time so I went. One of the main topics of discussion was: Now that we've had a nice upswing in the number of new licensees, the ham industry should take some responsibility in keeping these newcomers involved in the hobby.

One of my esteemed colleagues in the publishing field went on at some length, stressing the point that the industry hasn't done *anything* to help the newcomer, and that we ought to, as a group, be doing something. I was so astounded at this statement that I didn't open my mouth, but I will now.

I have a question for the entire amateur radio industry: What the hell do you think *Radio Fun* is? Wayne Green Incorporated has invested thousands and thousands of dollars in the starting and continuation of *Radio Fun*. We go to great pains to make sure that every single new licensee gets a couple of free issues of *Radio Fun* as sort of a "welcome to amateur radio." Do you know how much it costs to produce and mail over 10,000 free issues of *Radio Fun* every month? We work long and hard, trying to develop editorial features and columns that are specifically of interest to newcomers. For almost two years, the staff of *73* have been putting in extra time and effort to produce *Radio Fun*, and not one—NOT ONE—employee has received one penny in extra compensation. We haven't hired any new staff to take care of the added work load, either.

Am I telling you all this to get your sympathy? No! *Radio Fun* is a business, and we're sure that eventually it will be profitable. Business start-ups are risky any time, and in the middle of a recession they are almost insane. (I tried that argument with Wayne two years ago. He told me to get *Radio Fun* started anyway.) Yes, we started *Radio Fun* in order to help the newcomers, but none of you are so thick as to believe we didn't hope to eventually make a profit. Find a need and fill it. That's the American way.

73 isn't (and never has been) part of the ham radio industry clique. There was a time when we weren't allowed to exhibit at ARRL conventions. When we finally were allowed to exhibit, we were usually given booth space in the back corner of the exhibit hall. Even though those days are over, we continue to pay the price for past and present boat rocking. That's OK. It's the price you pay for speaking your mind, and for assuming that ham radio operators have enough intelligence to deal with tough issues and make up their own minds. Fine. We'll deal with the narrow-minded sheep who hang up on our ad reps or who send Wayne unsigned hate mail. We can deal with certain publications whose writers take pot shots at us, while hiding behind pen names. Those folks wouldn't know an original thought or a good idea if it bit them on the ass (and their publications are a joke, anyway). All of this, and much more, are part of the package when you work for Wayne, but for the ham radio industry, because of petty jealousy, to simply ignore (and in a few cases, to back out of signed advertising agreements) the fact that *Radio Fun* exists is ludicrous.

I would like to remind the ham industry that one company—the company that brings you *73*—*has* done something to help keep the newcomers involved. *Radio Fun* is the only publication that guarantees exposure to the entire population of ham radio beginners. Just because a small vocal minority of League-brainwashed companies have some unspecified problem with Wayne Green doesn't change the fact that he is the *only* one of you who has put his money where his mouth is when it comes to helping the newcomers.

I'll clue you into another fascinating fact: The 25,000+ monthly readers of *Radio Fun* love it. Since we started *Radio Fun* we have received exactly three—THREE—complaint cancellations. Our renewal rate after the first year is astounding. Except for the occasional late mailing or ripped magazine, we have received absolutely no complaints about the magazine's content. We get buckets of mail from newcomers who thank us for providing a publication for them. I have actually had people—dozens of them—walk up to me at shows and thank me for *Radio Fun*. They are thanking me for something they are paying for! It's amazing.

And yet, the ham radio industry has the nerve to sit around and complain that nothing is being done for the newcomer. Give me a break, guys! *Radio Fun* is there, and it has been for close to two years. It will be there two years from now, too. It reaches an audience that nobody else is reaching, for a fraction of the cost of any other advertising method. In fact, we are currently working on a program that will make it possible for just about any company to advertise in *Radio Fun* for such a low rate that it totally negates the old "we can't afford to advertise" complaint. In fact, certain types of products won't pay anything.

I don't mind taking heat for Wayne and his outspoken views. I don't mind the occasional snub we get from some of the less-enlightened in our industry (though, taking out their 20-year-old anger at Wayne on his employees seems a bit dumb). I can accept that there are those who, out of spite and jealousy, are willing to pass up the opportunity to make money (I don't understand it, but I can accept it). What I can't accept is a small minority of know-it-alls who choose to ignore the fact that *Radio Fun* exists—that it's *another* good idea from the fertile mind of Wayne Green—and, most importantly, that the folks listed on the masthead of this magazine work their butts off to give the ham industry the opportunity to reach a lucrative new audience.

You guys can choose to ignore our efforts if you want. If you don't see the business sense of advertising in *Radio Fun* then there's not much we can do for you (though I can't fathom why a company would not want to reach the newcomers). Let's just not forget that when you were sitting around complaining that nothing was being done, Wayne Green and his Team had already been hard at work for almost two years. 73

Number 30 on your Feedback card

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 East Chateau Circle
Payson AZ 85541

December "conditions" are expected to be very interesting astronomically as well as ionospherically. Beginning on December 23rd and extending to December 24th, there will be a PARTIAL ECLIPSE OF THE SUN sun visible in eastern China, Korea, Japan, extreme eastern Siberia, and southwestern Alaska. On December 9th-10th there will be a TOTAL ECLIPSE OF THE MOON visible in Asia, Europe and Britain, Africa, Iceland, Greenland, S. America (except southernmost), Central America, and North America (except the West Coast).

December will bring excellent HF openings on Good (G) days during the month with DX during daylight hours into most parts of the world—moving westward with the sun. The higher HF bands will close earlier than in summer, but you can expect good short-skip openings also during the daytime. The bands above 30 meters will close by dark or a little after. The HF bands from 30 meters down through 160 will become increasingly DX-active during the late afternoon and evening hours, and will continue to provide openings around the world until after dawn. Short skip from coast to coast will also be available during the nighttime hours on most of the lower HF bands. In general, the lower the frequency, the later the bands will open for DX, with 30 meters opening in mid-afternoon followed by 40 meters and finally 80 and 160 meters in the early evening hours.

Be sure to use grey-line propagation, too, which follows the paths of sunrise and sunset around the world. Long path openings may also be expected in early morning hours as well, so December should offer some good DX opportunities.

The charts show which day ought to be Good (G) Fair (F) or Poor (P). The poor days will be centered around December 4th and I think you will find the days surrounding this date to be very "interesting" in a geophysical sense. Be particularly alert for solar disturbances, and magnetic field storms on earth. Also, around the 15th and 19th there are likely to be unusual propagation conditions.

By now, almost everyone realizes that the solar flux values have been low for the past several months, coincident with declining sunspot numbers. The peak activity of Cycle 22 was during August 1989, so the minimum is likely to occur in 1995 or 1996 . . . perhaps sooner! Recent studies seem to point toward an apparent "cycle" of 22 years—with two peaks and two minima.

Did you notice that I was clearly WRONG about October's predicted POOR days on the 5th and 6th? These were great days for propagation . . . As I write, the predicted Poor conditions for October around the 9th, the 17th and 20th, and again on the 30th and 31st, haven't occurred, so maybe I'll be vindicated. We'll just wait and see. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	20	-	-	-	-	20	20	-	-	-	15
ARGENTINA	20	40	40	40	-	-	-	20	15	15	10	10	15
AUSTRALIA	15	20	20	-	40	40	40	-	-	20	20	15
CANAL ZONE	20	20	20	20	20	20	20	15	10	10	15	15
ENGLAND	40	40	40*	40*	-	20	15	10	15	20	20	-
HAWAII	15	20	-	-	-	-	20	20	20	10	10	15
INDIA	-	-	-	-	-	-	20	20	-	-	-	-
JAPAN	15	20	-	-	-	-	20	20	-	-	-	15
MEXICO	20	20	20	20	20	20	20	15	10	10	15	15
PHILIPPINES	-	-	-	-	-	-	20	20	-	-	-	-
PUERTO RICO	20	20	20	20	20	20	20	15	10	10	15	15
SOUTH AFRICA	20	40*	-	-	-	-	20	10	10	10	15	20
U. S. S. R.	-	-	-	-	-	-	20	15	20	20	-	-
WEST COAST	15/20	20/40	80	160	160	160	-	-	-	10	10	15

CENTRAL UNITED STATES TO:

ALASKA	15	-	-	-	-	-	-	20	-	-	-	15
ARGENTINA	20	20	20	40	40	-	20	20	15	10	15	15
AUSTRALIA	15	20	20	-	-	-	40	-	-	-	15	10
CANAL ZONE	15	20	40	40*	40*	-	20	15	10	10	10	15
ENGLAND	40	40	80	-	-	-	-	20	15	15	20	40
HAWAII	15	20	-	40	40	40*	40*	20	20	15	10	15
INDIA	-	-	-	-	-	-	-	20	-	-	-	-
JAPAN	15	-	-	-	-	-	-	20	-	-	-	15
MEXICO	15	20	40	40*	40*	-	20	15	10	10	10	15
PHILIPPINES	15	20	-	-	-	-	-	20	-	-	-	15
PUERTO RICO	15	20	40	40*	40*	-	20	15	10	10	10	15
SOUTH AFRICA	20	40	-	-	-	-	-	15	10	10	15	20
U. S. S. R.	-	-	-	-	-	-	-	20	15	20	-	-

WESTERN UNITED STATES TO:

ALASKA	10	15	20	-	-	-	40	40	40	-	-	20
ARGENTINA	15	20	-	40	40	-	-	20	-	10	10	15
AUSTRALIA	10	15	20	20	-	-	40*	40*	20	20	15	15
CANAL ZONE	15	20	20	-	-	-	-	20	15	10	10	10
ENGLAND	20	40	40	-	-	-	-	-	15	15	20	20
HAWAII	10	15	20	40	40	40	-	20	20	15	15	10
INDIA	-	15	20	-	-	-	-	-	20	-	-	-
JAPAN	10	15	20	-	-	-	40	40	40	-	-	20
MEXICO	15	20	20	-	-	-	-	20	15	10	10	10
PHILIPPINES	10	15/20	15/20	-	-	40	40	40	-	20	-	20
PUERTO RICO	15	20	20	-	-	-	40	40	40	-	-	20
SOUTH AFRICA	20	20	-	-	-	-	-	15	10	10	15	15
U. S. S. R.	-	-	-	-	-	-	-	20	20	-	-	-
EAST COAST	15/20	20/40	80	160	160	160	-	-	-	10	10	15

*Try 80 meters.

The bands shown represent the highest usable a these times on "Good Days."

Note that the lower frequency bands open first and close last.

DECEMBER

		1 G-F	2 F-P	3 P	4 P	5 P-F
6 F-G	7 G	8 G	9 G	10 G	11 G-F	12 F
13 F-P	14 F-P	15 F-P	16 F-G	17 F	18 F	19 F-G
10 G	21 G	22 G-F	23 F	24 F-G	25 G	26 G
27 G-F	28 F	29 F-G	30 G	31 G		

FT-530
Dual Band Handheld

- **Frequency Coverage:**
  2-Meters 130-174 MHz RX
  140-150 MHz TX
  70 cm 430-450 MHz RX/TX
- 82 Memories (41 per band)
- 4 TX Power levels
  w/FNB-25: 2.0, 1.5, 1.0, 0.5W
  w/FNB-27: 5.0, 3.0, 1.5, 0.5W
- Dual in-band receive feature (V/V, U/U or V/U receive operation)
- DTMF Paging and Coded squelch included.
- AOT – Auto On-Timer with built-in clock
- ABS – Automatic Battery Saver (Super battery life, each band can have separate battery saver)
- Built-in VOX
- IBS – Intelligent Band Select (provides automatic TX band select on scan stop)
- Built-in CTCSS with dual decode
- ATS – Automatic Tone Search (displays incoming CTCSS frequency)
- Back-lit keypad and display with time delay
- Built-in cross-band repeat function
- APO – Automatic Power Off
- 5 Watts output w/ FNB-27 battery or 12 VDC
- 2 VFO's for each band
- **Accessories:**

NC-42	1-hour Desk Charger
FNB-25	600 mAh Battery (2 watt)
FNB-26	1000 mAh Battery (2 watt)
FNB-27	600 mAh Battery (5 watt)
FBA-12	6 AA Cell Holder
CSC-56	Vinyl Case w/ FNB-25
CSC-58	Vinyl Case w/ FNB-26/27
E-DC-5	12 VDC Adaptor
YH-2	Headset for VOX
MH-12A2B	Speaker Mic
MH-18A2B	Lapel Speaker Mic
MH-19A2B	Mini Earpiece Mic
MH-29A2B	LCD Display Mic with Remote Functions
MMB-54	Mobile Mounting Hanger

"Look at this new FT-530! Simultaneous receive on VHF and UHF, automatic "on" timer, 82 memory channels..."

"Yaesu did it again!"

Bright minds lead to brilliant "firsts."

That's right, brilliant innovative first-time ever features which make the FT-530 our most exciting HT addition.

Exclusive break-through features, too. Like flexible in-band dual receive. Not just V/U receive. With the FT-530 you can listen to two, 2-meter signals at the same time!

Another remarkable first is the Auto On-Timer™. Here's how it works. Choose the hour you'd like the radio to begin operating. For example, set the time for the morning, then wake up to your favorite net. What's more, the built-in 24-hour clock displays the time when the radio is off.

First out with 82 memory channels included, not an option; a real plus for storing all your favorite frequencies. With this HT, just open the box and QSO.

There's a lot of other terrific features too, such as built-in VOX and DTMF paging. And, since we know you'll find the FT-530 indispensable, we've included an automatic battery saver and voltage display – a powerful handful of exclusive features!

Be the first at your dealer's door to buy one, and the first to show off your new FT-530. What a bright idea!

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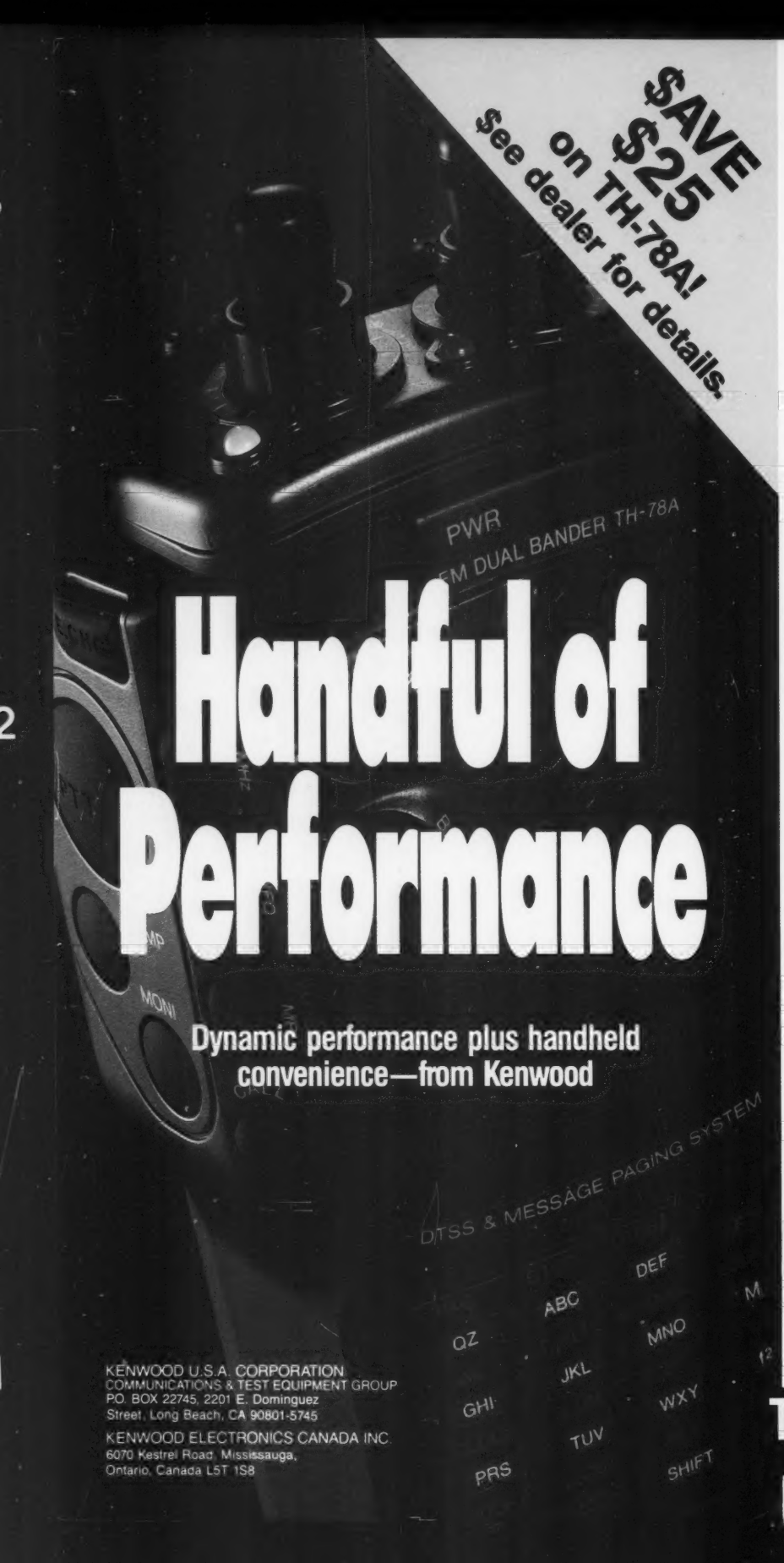
Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.



$AVE $25 on TH-78A! See dealer for details.

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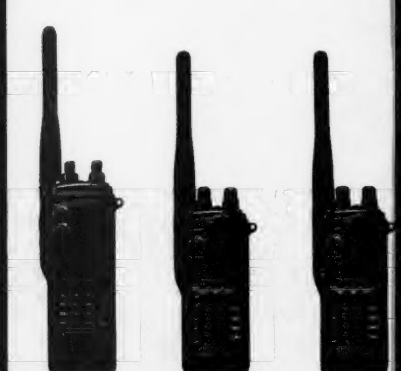
To get the most out of handheld communications, choose Kenwood's TH-78A (144MHz/440MHz) which offers all the latest features. Or the TH-28A (144MHz) and TH-48A (440MHz) single-band transceivers, which are equally impressive. All three represent a winning combination of top-flight technology and ergonomic design.

- **Alphanumeric memory**
  Alphanumeric data (max. 6 characters) can be entered directly into memory.
- **Alphanumeric message paging**
  In addition to standard DTSS and paging functions, alphanumeric messages can be stored in memory for immediate transmission.
- **Dual-frequency receive**
  In addition to full-duplex cross-band operation, the TH-78A is equipped to receive two frequencies simultaneously, even on the same band. There's also independent double-band scan and ABC (automatic band change). The TH-28A and TH-48A feature dual-band receive capability, enabling semi-duplex cross-band operations (TH-28↔TH-48A).
- **Frequency coverage**
  TH-28A: 118-173.995 MHz, sub RX: 438-449.995 MHz; TH-48A: 438-449.995 MHz, sub RX: 136-173.995 MHz; TH-78A: 118-173.995, 438-449.995 MHz. Transmit on Amateur bands only. (MARS/CAP modifiable, permits required).
- **2.5W power with supplied battery pack**
  5W with 12 VDC power source (PB-14, PB-17, or external DC).
- **Non-volatile memory**
  The TH-78A has 50 memory channels (expandable to 250 with the ME-1 option), while the TH-28A and TH-48A have 40 channels (expandable to 240 with the ME-1 option).



TH-78A/28A/48A
FM Handheld Transceivers